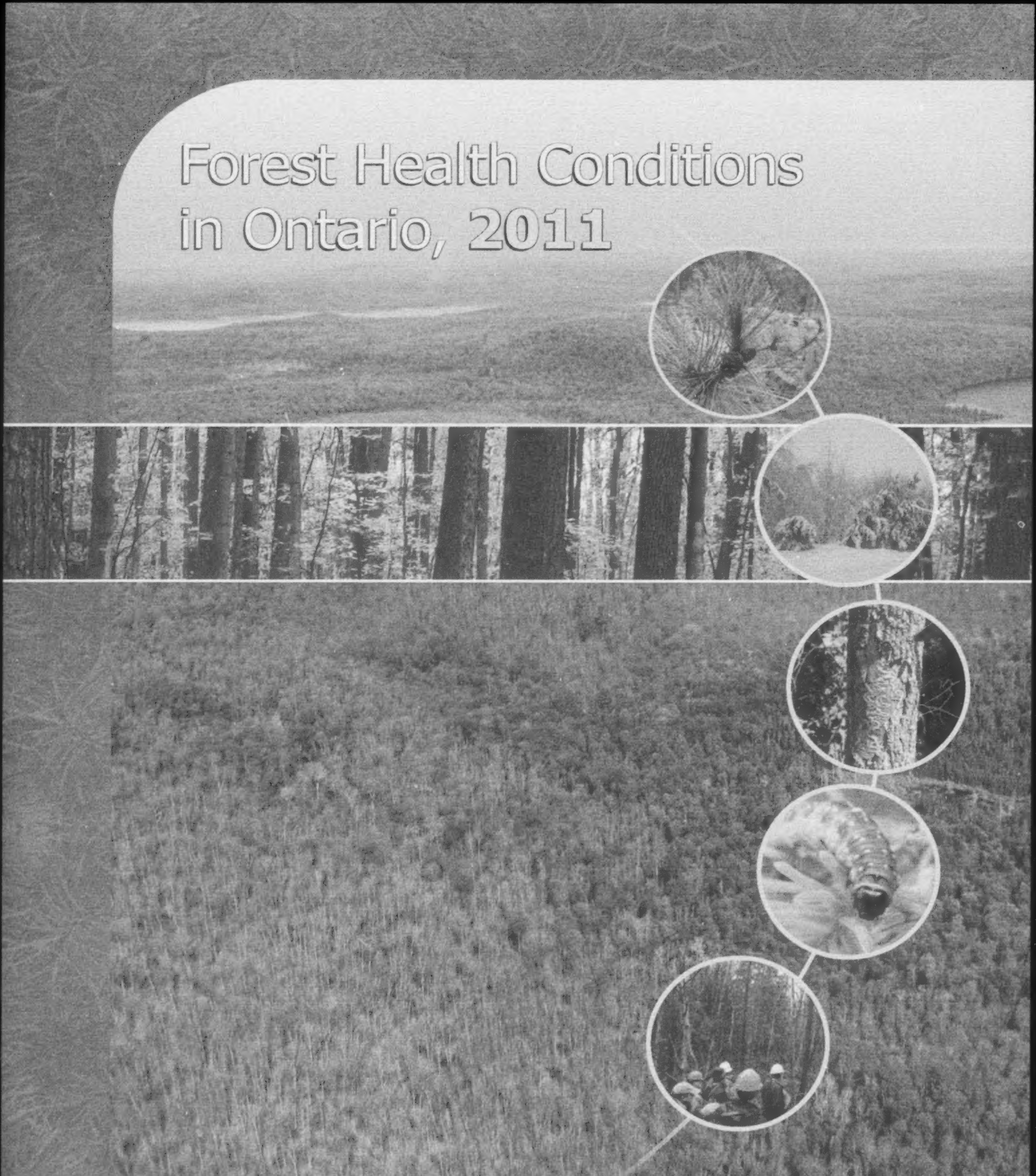
Forest Health Conditions in Ontario, 2011



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Forest Health Conditions in Ontario, **2011**

Edited by:

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For more information on forest health in Ontario visit the Ontario Ministry of Natural Resources website: www.ontario.ca/foresthealth

You can also visit the Canadian Forest Service website: www.glfc.cfs.nrcan.gc.ca

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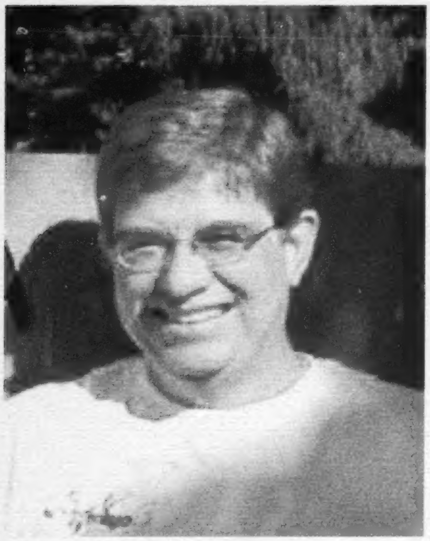
Front Cover Photos: *Circular photos top to bottom – Diplodia tip blight (W. Byman), Snow damage (S. Young), Emerald ash borer galleries (P.Hodge), Spruce budworm (W. Byman), Forestry workshop in Algonquin Park (P.Hodge).* ***Background:*** *Severe defoliation caused by forest tent caterpillar in Bancroft District (P. Hodge).* ***Banner:*** *Hardwood forest in autumn (P.Hodge).*

Forest Health Conditions in Ontario, **2011**

Dedication



We are proud to dedicate this report to the memory of our friend, colleague, and mentor, Dr. Peter de Groot, 1954-2010. Peter was a long-time supporter of forest health, forest entomology, and forest management in Ontario and Canada. A world class research scientist, Peter made significant contributions to forest entomology. This included over 70 research papers, seven books, 12 book chapters, several publications from conferences and workshops, and many government reports and publications. As an adjunct professor at University of Toronto and Lakehead University, Peter provided guidance and valuable direction to Masters and Ph.D. students.

Peter was a regular presenter at Ontario's Annual Forest Health Review, imparting his scientific knowledge and expertise, and sharing his latest research results. He also provided invaluable advice to the Canadian Forest Service (CFS) and the Ontario Ministry of Natural Resources (OMNR) in the design and implementation of the forest health monitoring program. Over the last few years Peter helped mediate the transition from a CFS-led field program to an OMNR-led field program.

After starting his career with the OMNR as a field technician in 1974, Peter graduated with his Forest Technician Diploma from Sault College in 1975. He was hired that same year as a research technician by the CFS. He went on to earn his Honours B.Sc. in Forestry from Lakehead University in 1981 and then his Ph.D. from Simon Fraser University in 1991.

Eventually rising to the level of senior scientist, Peter was happiest when his boots were dirty. Adept in the lab or writing in his office, it was field work that invigorated him. He taught us the importance of observing the biological system in which we are working. In this way we could better design our research and understand the results. Peter's strength was in growing people. He was a mentor to everyone from summer students to friends, peers, and senior managers. His scientific excellence, integrity, attention to detail, and humour were among his many assets that earned him our respect, admiration, and friendship.

Peter is also remembered for his devotion to his family: his loving wife Elizabeth (Liz) Deakin-de Groot, children Cathleen and Jonathan, and grandchildren Adalia, Deiderich, and Quinn. We thank them for letting us share in Peter's life.

TABLE OF CONTENTS

Forest Health Conditions in Ontario, 2011 iii
Dedication iii
Acknowledgements xi

Section 1 – Forest Health Monitoring in Ontario, 2011

PROGRAM OVERVIEW 1
  Introduction 1
  Forest Health Monitoring 2
  2011 Forest Health Conditions Report 2
2011 SUMMARY OF EVENTS 5
  Weather patterns 5

Section 2 – Major Forest Disturbances

FOREST INSECTS

  Spruce budworm, *Choristoneura fumiferana* (Clem.) 11
  Jack pine budworm, *Choristoneura pinus pinus* Free. 15
  Jack Pine Forest Health Plots 19
  Forest tent caterpillar, *Malacosoma disstria* Hbn. *21*

FOREST DISEASES

  Brown spot needle blight, *Mycosphaerella dearnessii* M.E. Barr (Anamorph: *Lecanosticta acicola* (Thümen) H. Sydow) 25

FOREST ABIOTIC EVENTS

  Blowdown 27

Section 3 – Invasive Species in Ontario's Forests

FOREST INSECTS

  Pine false webworm, *Acantholyda erythrocephala* (L.) 33
  Emerald ash borer, *Agrilus planipennis* Fairmaire 35
  Larch casebearer, *Coleophora laricella* (Hbn.) 39
  Birch casebearer, *Coleophora serratella* (L.) 41
  Beech scale, *Cryptococcus fagisuga* Linding. 41
  Introduced pine sawfly, *Diprion similis* (Htg.) 42
  Satin moth, *Leucoma salicis* (L.) 43
  Gypsy moth, *Lymantria dispar* (L.) 43
  European pine sawfly, *Neodiprion sertifer* (Geoff.) 45
  European fruit lecanium, *Parthenolecanium corni* (Bouche) 46
  Imported willow leaf beetle, *Plagiodera versicolora* (Laich.) 46
  Japanese beetle, *Popillia japonica* Newm. 47
  Pine shoot beetle, *Tomicus piniperda* (L.) 48

FOREST DISEASES

  White pine blister rust, *Cronartium ribicola* J.C. Fisch. 50
  Dogwood anthracnose, *Discula destructiva* Redlin 51

Beech bark disease, *Neonectria faginata* (M.L. Lohman, A.M.J. Watson & Ayers) Castl. & Rossman 51
Dutch elm disease, Ophiostoma *novo-ulmi* Brasier 53

Section 4 – Northwest Region

FOREST INSECTS

Bronze birch borer, *Agrilus anxius* Gory 55
Fall cankerworm, *Alsophila pometaria* (Harr.) 56
Birch skeletonizer, *Bucculatrix canadensisella* (Cham.) 56
Eastern larch beetle, *Dendroctonus simplex* (LeC.) 57
Birch-aspen leafroller, *Epinotia solandriana* (L.) 58
Striped alder sawfly, Hemichroa *crocea* (Geoff.) 58
Fall webworm, *Hyphantria cunea* (Drury) 58
Spiny elm caterpillar, *Nymphalis antiopa* (L.) 59
Aspen leafblotch miner, *Phyllonorycter apparella* (Free.) 59
Balsam poplar leafblotch miner, *Phyllonorycter nipigon* (Free.) 60
Northern pitch twig moth, *Petrova albicapitana* (Bsk.) 60
Yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.) 60
White pine weevil, *Pissodes strobi* (Peck) 60
Early aspen leafcurler, *Pseudexentera oregonana* (Wlsm.) 61
Poplar borer, *Saperda calcarata* Say 62

FOREST DISEASES

Armillaria root rot, *Armillaria* spp. 63
Ink spot of aspen, *Ciborinia whetzelii* (Seaver) Seaver 63
Fusicoccum canker of balsam fir, *Fusicoccum abietinum* (Hartig) Prill. & Delacr. 64
Western gall rust, *Peridermium harknessii* J.P. Moore 64

FOREST ABIOTIC EVENTS

Aspen decline 64
Drought/Scorch 67
Snow damage 69

Section 5 – Northeast Region

FOREST INSECTS

Alder flea beetle, *Altica ambiens* LeC. 71
Pinkstriped oakworm, *Anisota virginiensis* (Drury) 71
Cedar leafminer complex: Cedar leafminer, *Argyresthia aureoargentella* (Pack.) Arborvitae leafminer, *Argyresthia thuiella* Brower 72
Large aspen tortrix, *Choristoneura conflictana* (Wlk.) 72
Greenstriped mapleworm, *Dryocampa rubicunda* (F.) 74
Aspen twoleaf tier, *Enargia decolor* (Wlk.) 75
Oak trumpet skeletonizer, *Epinotia timidella* (Clem.) 75
Fall webworm, *Hyphantria cunea* (Drury) 76
Spiny elm caterpillar, *Nymphalis antiopa* (L.) 77
Balsam poplar leafblotch miner, *Phyllonorycter nipigon* (Free.) 77

Aspen leafblotch miner, *Phyllonorycter ontario* (Free.) ... 78
Redhumped oakworm, *Symmerista canicosta* Franc. ... 78
Orangehumped mapleworm, *Symmerista leucitys* Franc. ... 79

FOREST ABIOTIC EVENTS

White pine browning ... 79

Section 6 – Southern Region

FOREST INSECTS ... 81
Erineum mite, *Acalitus fagerinea* (Keifer) ... 81
Acordulecera sawfly, *Acordulecera dorsalis* Say ... 82
Bronze birch borer, *Agrilus anxius* Gory ... 82
Fall cankerworm, *Alsophila pometaria* (Harr.) ... 82
Birch sawfly, *Arge pectoralis* (Leach) ... 83
Basswood leafminer, *Baliosus nervosus* (Panz.) ... 84
Cedar leafminer complex: Brown cedar leafminer, *Coleotechnites thujaella* (Kft.); ... 84
Cedar leafminer, *Argyresthia aureoargentella* Brower; Cedar leafminer, *Argyresthia canadensis* Free; Arborvitae leafminer, *Argyresthia thuiella* (Pack.)
Oak leafshredder, *Croesia semipurpurana* (Kft.) ... 86
Elm casebearer, *Coleophora limosipennella* (Dup.) ... 86
Cherry casebearer, *Coleophora pruniella* Clem. ... 87
Walnut caterpillar, *Datana integerrima* G. & R. ... 87
Cherry scallopshell moth, *Hydria prunivorata* (Fgn.) ... 88
Fall webworm, *Hyphantria cunea* (Drury) ... 88
Willow flea weevil, *Isochnus rufipes* (LeC.) ... 89
Eastern tent caterpillar, *Malacosoma americanum* (F.) ... 89
Hemlock borer, *Melanophila fulvoguttata* (Harris) ... 89
Balsam fir sawfly, *Neodiprion abietis* (Harr.) ... 90
Oak defoliator complex: Flat leaftier, *Psilocorsis reflexella* (Clem.); ... 90
Oak trumpet skeletonizer, *Epinotia timidella* (Clem.); Hickory leafroller, *Pseudexentera cressoniana* (Clem.); Oak skeletonizer, *Bucculatrix ainsliella* Murt.
Yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.) ... 91
Maple webworm, *Pococera asperatella* (Clem.) ... 91
Hickory leafroller, *Pseudexentera cressoniana* (Clem.) ... 91
Willow flea weevil, *Rhynchaenus rufipus* (LeC.) ... 92
Basswood thrips, *Sericothrips tiliae* Hood ... 92
Redhumped oakworm, *Symmerista canicosta* Franc ... 92
Bagworm, *Thyridopteryx ephemeraeformis* (Haworth) ... 93
FOREST DISEASES ... 93
Ash anthracnose, *Discula fraxinea* (Peck) Redlin & Stack ... 93
Maple anthracnose, *Discula umbrinella* (Berk. & Broome) M. Morelet ... 93
Basswood anthracnose, *Gloeosporium tiliae* Oudem. ... 93
Cytospora canker, *Cytospora chrysosperma* (Pers.) Fr. ... 94
Diplodia tip blight, *Sphaeropsis sapinea* (Fr.) Dyko & B. Sutton ... 94
Hornbeam anthracnose, *Monostichella robergei* (Desm.) Höhn ... 94
Septoria leaf spot of poplar, *Septoria musiva* Peck ... 95

Septoria leaf spot of birch, *Septoria betulae* Pass. 95
Septoria leaf spot of maple, *Septoria aceris* (Lib.) Berk. & Broome 95
FOREST ABIOTIC EVENTS 96
Drought 96
Scorch 96
White pine browning 96
Index **97**

List of figures

Figure 1.1 Forest health work areas and Ontario Ministry of Natural Resources administrative regions and districts. 3
Figure 2.1 Spruce budworm moderate-to-severe defoliation in Ontario, 1950-2011. 11
Figure 2.2 Areas-within-which spruce budworm caused moderate-to-severe defoliation in Ontario in 2011. 12
Figure 2.3 Spruce budworm feeding on white spruce in Bancroft District. 14
Figure 2.4 Areas-within-which spruce budworm caused mortality in Ontario in 2011. 14
Figure 2.5 White spruce mortality caused by spruce budworm, Sault Ste. Marie District. 15
Figure 2.6 Jack pine budworm moderate-to-severe defoliation in Ontario, 1950-2011. 15
Figure 2.7 Areas-within-which jack pine budworm caused moderate-to-severe defoliation in Northeast and Southern regions in Ontario in 2011. 17
Figure 2.8 Areas-within-which jack pine budworm caused moderate-to-severe defoliation Northwest Region in Ontario in 2011. 18
Figure 2.9 Light levels of jack pine budworm defoliation on young jack pine, Dryden District. 19
Figure 2.10 Early stages of jack pine budworm populations depend on the male pollen flowers to develop. This early instar larva feeds on jack pine flowers. 20
Figure 2.11 Mature forest tent caterpillar larva amongst lichen on sugar maple. 21
Figure 2.12 Forest tent caterpillar moderate-to-severe defoliation in Ontario, 1950-2011. 22
Figure 2.13 Areas-within-which forest tent caterpillar caused defoliation in Ontario in 2011. 23
Figure 2.14 Severe forest tent caterpillar defoliation on sugar maple in Midhurst District. 24
Figure 2.15 Forest tent caterpillar larvae infected by NPV and fungus *Furia gastropachae*. 24
Figure 2.17 Scots pine plantation infected with brown spot needle blight in Midhurst District. 26
Figure 2.16 Areas-within-which brown spot needle blight caused moderate-to-severe damage in Ontario in 2011. 26
Figure 2.18 Hedgerow of mature Scots pine infected with brown spot needle blight. 26
Figure 2.19 Areas-within-which blowdown occurred in Northwest Region in 2011. 28
Figure 2.20 Areas-within-which blowdown occurred in Northeast Region in 2011. 30
Figure 2.21 Blowdown in Hearst District. 30
Figure 2.22 Blowdown south of Westree in Timmins District. 30
Figure 2.23 Areas-within-which blowdown occurred in Southern Region in 2011 31
Figure 2.24 Blowdown near Goderich in Guelph District. 32
Figure 2.25 Areas-within-which blowdown caused severe damage in Ontario, 1975 – 2011. 32

Figure 3.1 Pine false webworm larvae feeding on Macedonian pine in Sault Ste. Marie District. 34
Figure 3.2 Adult emerald ash borer resting on an ash tree in Aylmer District. 35
Figure 3.3 Feeding galleries caused by emerald ash borer larvae located just under the bark of an ash tree in Aylmer District. 35
Figure 3.4 Areas regulated for the emerald ash borer by the Canadian Food Inspection Agency in Ontario in 2011. 37
Figure 3.5 Cumulative total area-within-which emerald ash borer caused moderate-to-severe decline and mortality 2004-2011. 38
Figure 3.6 Areas-within-which emerald ash borer caused severe decline or mortality to ash in Aylmer and Guelph districts in 2011. 38
Figure 3.7 Areas-within-which emerald ash borer caused decline or mortality to ash in Kemptville District in 2011. 39
Figure 3.8 Larch case bearer larva feeding from with the protective casement constructed from previously mined foliage. 39
Figure 3.9 Areas-within-which larch casebearer caused moderate-to-severe defoliation in Ontario in 2011. 40
Figure 3.10 Moderate-to-severe defoliation caused by larch case bearer to tamarack in Peterborough District 40
Figure 3.11 Birch casebearer on white birch in Charleston Lake Provincial Park, Leeds and Grenville County, Kemptville District in 2011. 41
Figure 3.12 High levels of beech scale on American beech in Bruce County, Midhurst District. 42
Figure 3.13 Satin moth larvae feeding on European white poplar 43
Figure 3.14 Gypsy moth moderate-to-severe defoliation in Ontario, 1981-2011 44
Figure 3.15 European pine sawfly larvae feeding on Scots pine, Peterborough District. 45
Figure 3.16 European fruit lecanium feeding on red oak. 46
Figure 3.17 Larvae of the imported willow leaf beetle in Peterborough District. 47
Figure 3.18 Adult Japanese beetle in Midhurst District. 47
Figure 3.19 Severe defoliation on white birch caused by Japanese beetle in Midhurst District. 47
Figure 3.20 Areas regulated for the pine shoot borer by the Canadian Food Inspection Agency in Ontario in 2011. 48
Figure 3.21 Trapping locations and results for pine shoot beetle in Ontario in 2011 49
Figure 3.22 Leaf spots caused by dogwood anthracnose on eastern flowering dogwood in Aylmer District in 2011. 51
Figure 3.23 Mature American beech heavily infected with beech bark disease, showing lemon shaped patterns of fruiting bodies that are old (dark red-to-black), new (bright red), and parasitized (tan). 52
Figure 3.24 Beech bark disease and beech scale distribution in Ontario in 2011. 52
Figure 3.25 Severe decline and mortality of elm due to Dutch elm disease infection in southern Ontario in 2011 54
Figure 4.1 Larval galleries created by bronze birch borer causing decline and mortality to white birch 55
Figure 4.2 Fall cankerworm feeding on Manitoba maple. 56
Figure 4.3 Birch skeletonizer larvae feeding on white birch foliage. 56
Figure 4.4 Areas-within-which eastern larch beetle caused decline and mortality to aspen in Ontario in 2011 57
Figure 4.5 Birch-aspen leafroller larvae exposed from feeding chamber. 58
Figure 4.6 Striped alder sawfly larvae feeding on alder foliage. 58
Figure 4.7 Webbing created by the fall webworm on alder. 58
Figure 4.8 Spiny elm caterpillar larvae. 59

Figure 4.9 Aspen leafblotch miner pupa in excavated feeding chamber. 59
Figure 4.10 Excavated pitch nodule containing several larvae. 60
Figure 4.11 Current year's damage to roadside jack pine regeneration by white pine weevil. 61
Figure 4.12 Areas-within-which early aspen leafcurler caused moderate-to-severe defoliation in Ontario in 2011. 61
Figure 4.13 Aspen crowns affected by early aspen leafcurler. 62
Figure 4.14 Poplar borer in excavated larval gallery. 62
Figure 4.15 Desiccated foliage of aspen severely affected by ink spot. 63
Figure 4.16 Sporulating gall of western gall rust on young jack pine tree. 64
Figure 4.17 Areas-within-which aspen decline caused moderate-to-severe damage to aspen in Ontario in 2011. 66
Figure 4.18 Areas-within-which aspen decline caused mortality to aspen in Ontario in 2011. 67
Figure 4.19 Areas-within-which drought caused moderate-to-severe damage in Ontario in 2011. 68
Figure 4.20 Foliage of aspen trees showing the effects of drought. 68
Figure 4.21 Jack pine tree experiencing premature needle drop due to drought conditions. 68
Figure 4.22 Young jack pine trees snapped due to heavy snow loading. 69
Figure 5.1 Pinkstriped oakworm feeding on red oak, Kirkwood Township, Sault Ste. Marie District. 71
Figure 5.2 Severe defoliation caused by large aspen tortrix. 73
Figure 5.3 Areas-within-which large aspen tortrix caused moderate-to-severe defoliation in Ontario in 2011. 73
Figure 5.4 Greenstriped mapleworm feeding on understory red maple, Kirkwood Township, Sault Ste. Marie District. 74
Figure 5.5 Adult aspen two leaftier at rest, Sault Ste. Marie District. 75
Figure 5.6 Areas-within-which aspen two-leaftier caused moderate-to-severe defoliation in Ontario in 2011. 76
Figure 5.7 Oak trumpet skeletonizer feeding tube and larva, Sault Ste. Marie District. 76
Figure 5.8 Fall webworm larvae feeding within webbing on a white birch, Sudbury District. 77
Figure 5.9 Spiny elm caterpillar feeding on willow, Sault Ste. Marie District. 77
Figure 5.10 Brown blisters resulting from balsalm poplar leafbloth miner, North Bay District. 77
Figure 5.11 Brown foliage on trembling aspen caused by aspen leafblotch miner, North Bay District. 78
Figure 5.12 Redhumped oakworm larva on understory red oak, Sault Ste. Marie District. 78
Figure 5.13 Orangehumped mapleworm on an American beech tree, Sault Ste. Marie District. 79
Figure 5.14 The four white pine trees monitored for dook's needle blight. The three infected pine species being Macedonian pine and the fourth a hybrid of Japanese and western white pine in Sault Ste. Marie District. 80
Figure 6.1 Galls induced by erineum mites on the underside of American beech foliage, Peterborough District in 2011. 81
Figure 6.2 Acordulecera sawfly larvae feeding on red oak foliage. 82
Figure 6.3 Bronze birch borer larva exposed from a feeding gallery under the bark of white birch. 82
Figure 6.4 Areas-within-which fall cankerworm caused light defoliation in Ontario in 2011. 83
Figure 6.5 Birch sawfly larva feeding on white birch. 83

Figure 6.6 Adult basswood leaf miners performing maturation feeding in Midhurst District. 84
Figure 6.7 Areas-within-which cedar leafminer caused moderate-to-severe defoliation in Ontario in 2011. 85
Figure 6.8 Newly emerged cedar leafminer adult moth....85
Figure 6.9 Light defoliation on eastern white cedar caused by cedar leafminer. 86
Figure 6.10 Larvae feeding on slippery elm from within its protective case. 86
Figure 6.11 Cherry casebearer feeding on white birch, Bancroft District. 87
Figure 6.12 Late instar walnut caterpillar larvae feeding gregariously on black walnut near Cambridge, Guelph District. 87
Figure 6.13 Cherry scallopshell moth within tied feeding chambers on black cherry....88
Figure 6.14 Fall webworm larvae exposed from its protective silk webbing. 88
Figure 6.15 Eastern tent caterpillar exposed from webbed tent on black cherry....89
Figure 6.16 Adult hemlock borer recently emerged from eastern hemlock. 89
Figure 6.17 Balsam fir sawfly larvae feeding on epidermal layer of balsam fir foliage in Bancroft District. 90
Figure 6.18 Moderate levels of defoliation to red oak in Midhurst District caused by a complex of defoliators. 90
Figure 6.19 Defoliation to spruce caused by yellowheaded spruce sawfly....91
Figure 6.20 Adult willow flea weevil feeding on shining leaved willow. 92
Figure 6.21 Late instar red humped oakworm larvae feeding on white oak....92
Figure 6.22 Bagworm pupae in protective 'bag' made from host foliage on honey locust in Windsor, Aylmer District. 93
Figure 6.23 Red pine shoot and cones infected with diplodia tip blight in Parry Sound District. 95
Figure 6.24 Foliage of ironwood affected by hornbeam anthracnose. 95
Figure 6.25 White birch foliage severely affected by Septoria leaf spot of birch. 95

List of tables

Table 2.1 Areas-within-which spruce budworm caused moderate-to-severe defoliation in Ontario, 2007-2011. 13
Table 2.2 Areas-within-which jack pine budworm caused moderate-to-severe defoliation in Ontario, 2007-2011. 16
Table 2.3 Condition of all trees in jack pine forest health plots in Ontario, 2011. 20
Table 2.4 Condition of all tree tops and abundance of flowers of live trees in jack pine forest health plots in Ontario, 2011. 21
Table 2.5 Cumulative area of moderate-to-severe defoliation by forest tent caterpillar in Ontario, 2007-2011. 22
Table 2.6 Areas-within-which severe blowdown was recorded in Ontario, 2007-2011 ...27
Table 3.1 Area of moderate-to-severe defoliation caused by pine false webworm in Ontario from 2003-2011....34
Table 3.2 Cumulative area of severe decline and mortality in ash species caused by emerald ash borer in Ontario 2004-2011 37
Table 3.3 Cumulative area of moderate-to-severe defoliation caused by gypsy moth in Ontario 2007-2011 44
Table 4.1 Area of moderate-to-severe aspen decline in Northwest Region 2008-2011. .65
Table 5.1 Cumulative area of moderate-to-severe defoliation caused by large aspen tortrix in Northeast Region. 72

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The forest health monitoring program in Ontario is conducted in partnership between the Ontario Ministry of Natural Resources (OMNR) and the Canadian Forest Service (CFS) of Natural Resources Canada. The annual field program is designed by Taylor Scarr[1], Richard Wilson[1] and Krista Ryall[2] and coordinated by Dan Rowlinson[3]. The province is divided into 12 work areas (Figure 1.1), with OMNR Forest Health Technical Specialists conducting the surveys and monitoring.

Forest Health Technical Specialists conduct aerial surveys, perform ground checks to verify aerial surveys, assess ground plots, deploy traps to detect and monitor insects, collect insect and disease samples, and participate in research and monitoring programs. They also provide extension services to forest managers and landowners, and make presentations on local conditions at various workshops and seminars.

In 2011, the OMNR Forest Health Technical Specialists were:

Will Byman[3] (Sudbury-Parry Sound)
Mike Francis[3] (Sault Ste. Marie)
Patrick Hodge[3] (Peterborough-Bancroft)
Rebecca Lidster[3] (Aylmer-Guelph)
Susan McGowan[3] (Midhurst-Aurora)
Lincoln Rowlinson[3] (Thunder Bay-Nipigon)
Cheryl Widdifield[3] (North Bay-Kirkland Lake)
Steven Young[3] (Dryden-Red Lake-Sioux Lookout)
Aspen Zeppa[3] (Algonquin Park-Pembroke-Kemptville)

Wayne Ingram[1] and Al Keizer[2] provided mentoring of OMNR field staff as well as participating in CFS research projects. Eric Cleland[3] and Tyler Straight[3], currently on internal secondments from their home positions as forest health technical specialists, helped to conduct aerial surveys. Johanne Horne[3] who was on leave during the field program from her forest health technical position provided reviews and edits of the Northeast Region Chapter.

Data management and GIS support was provided by Larry Watkins[1] and Ken McCulloch[3]; all forest disturbance maps for this report were compiled by Ryan McMillan[1]. Insect identification was provided by Kathryn Nystrom[2] with assistance from Isabelle Ochoa[2]; fungal identification was provided by Sylvia Greifenhagen[4]. Historical data and analytical support provided by Ron Fournier[2]. Program pathology and mycology guidance and expertise were provided by Richard Wilson[1]. Program entomology guidance and expertise were provided by Taylor Scarr[1]. Research projects were designed and led by Krista Ryall[2] and Jeff Fidgen[2]. All photos used in this report are credited to an individual source.

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Forest Health Monitoring in Ontario, 2011

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SECTION 1

PROGRAM OVERVIEW

Introduction

Forest health monitoring in Ontario is conducted as a partnership between the Ontario Ministry of Natural Resources (OMNR) and Natural Resources Canada-Canadian Forest Service (CFS). This federal-provincial collaboration began in the 1930s, and has been formalized under a series of memoranda of understanding.

The forest health partnership has evolved over the years as the mandates of the two organizations have changed. While the CFS and its predecessors have historically conducted the bulk of the field work, since 1998, the two organizations have combined their field resources to deliver a joint program that integrates forest health monitoring and research.

In 2011, the forest health monitoring component was delivered by OMNR field staff who conducted the surveys, carried out plot assessments, responded to extension calls, and performed mapping surveys. The CFS conducted several research projects in insect survey or monitoring methodologies and tools, as well as in forest decline and pest impacts. The CFS also collaborated with OMNR on the development of a manual for conducting aerial surveys for forest health monitoring.

Forest Health Monitoring

Recording and reporting of forest health conditions in Ontario includes monitoring the occurrence of both native and invasive biotic (e.g., insect, disease), and abiotic (e.g., severe weather) disturbances and events. The monitoring program consists of permanent sample plots, temporary sample plots, plantation surveys, and aerial mapping of major forest disturbances. All forest areas are included: provincial Crown land, federal lands, First Nations territories, parks, and private land and urban areas. Ad hoc sampling of insects and diseases is also done to maintain a database of their occurrence in the province.

To ensure the agents affecting tree health are correctly diagnosed, the insect samples are collected and sent to the CFS, Great Lakes Forestry Centre for identification. Disease samples are sent to the Ontario Forest Research Institute. These records of insect and disease occurrence provide a long term database of the identification of biotic factors affecting forest health, and their geographic location.

The maps generated from the aerial surveys are entered into OMNR's Natural Resources and Values Information System (NRVIS) dataset which manages the province's digital land information.

Interim or preliminary findings of insect, disease, or weather events detected during the field season are reported through periodic forest health updates. These updates are produced by the individual forest health technician for their specific work area. The updates are distributed to client groups including forest industry, government, landowners and other interested stakeholders.

Final results of the program are presented at the Annual Forest Health Review which includes forest health monitoring, research, policy, and management programs in Ontario. The results are also reported at the annual Forest Pest Management Forum as part of a national overview of forest health for each province and territory.

The results of the monitoring program are used to report on the health of Ontario's forests and the major factors affecting forest health. The information is used to develop forest pest management and forest management policy, for planning pest management programs, identifying research needs, and prioritizing and designing research projects. The information is also used to support other initiatives such as criteria and indicators of forest sustainability, state of the forest reporting, biodiversity objectives, invasive species strategies and programs, and climate change programs.

2011 Forest Health Conditions Report

The *Forest Health Conditions Report* presents the results of annual surveys and monitoring conducted by the forest health monitoring partnership in Ontario. It is published by the OMNR as part of the partnership between OMNR and the CFS. The report is a continuation of a series of annual Forest Health Monitoring reports produced by the CFS from 1995 to 2003, which was preceded by annual reports of the Forest Insect and Disease Survey, also produced by the CFS.

The report is divided into chapters of major forest disturbances, invasive species, and regional reports for each of OMNR's three administrative regions (Figure 1.1). Major forest disturbances are insect, disease, or weather events that affect very large areas, are not specific to a region (e.g., storm events), or currently or historically have affected more than one region. This chapter typically describes events that are of provincial significance. The invasive species chapter reports on the status of insects and diseases that are not native to Ontario and have the potential or proven ability to have deleterious effects on forest health, tree health, ecosystem functioning, or social or economic values. The regional chapters report on forest health conditions for each region, except for the major forest disturbances and invasive species.

The insects and diseases are presented in alphabetical order by Latin name within each chapter. A species index is included in Appendix A to help readers search for an individual species. The report uses common names, except where none exists. For each chapter, the Latin name and scientific authority are also given the first time a species is mentioned in that chapter. Thereafter the insect or disease is referred to by its common name within that chapter. The text of the report uses the common name for tree host species. Appendix B

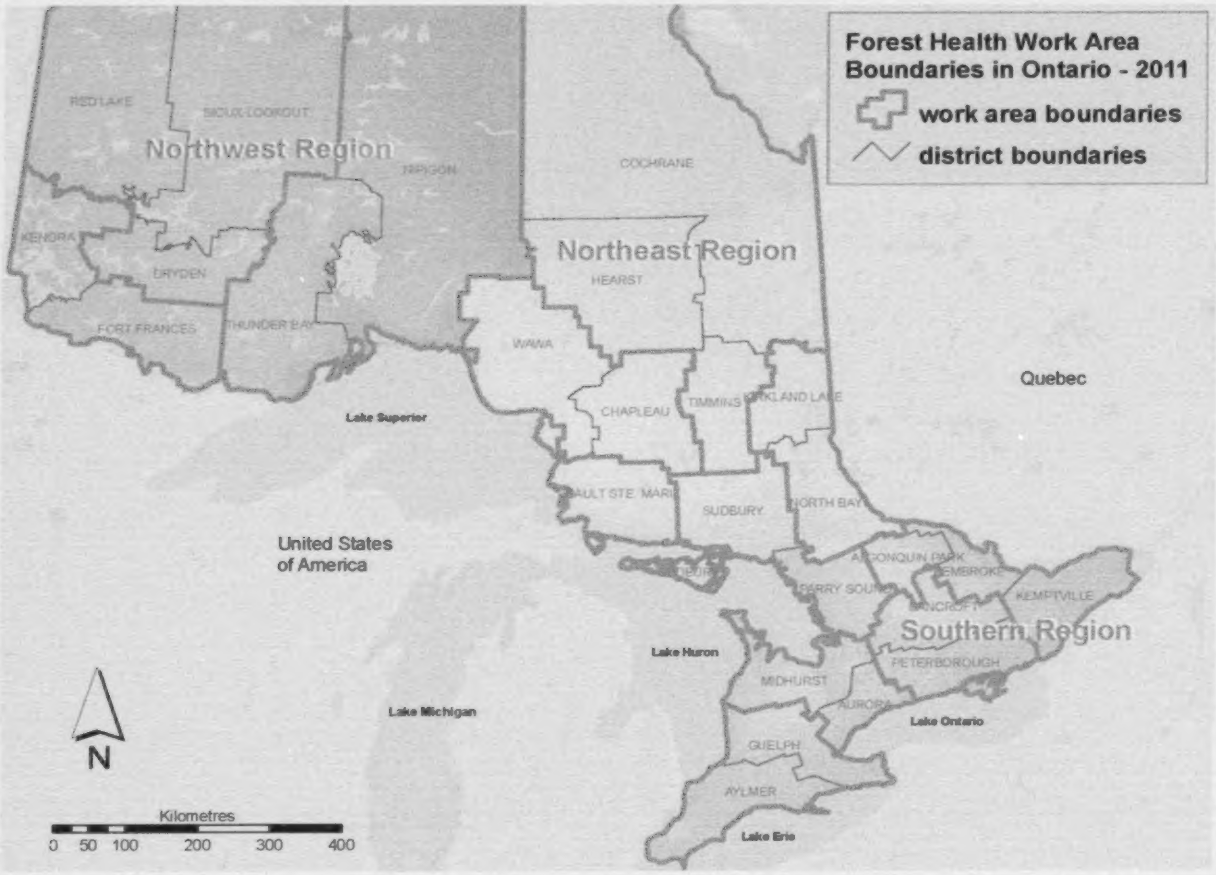

Forest Health Work Area Boundaries in Ontario - 2011
work area boundaries
district boundaries
RED LAKE
SIOUX LOOKOUT
Northwest Region
NIPIGON
COCHRANE
KENORA
DRYDEN
FORT FRANCES
THUNDER BAY
Northeast Region
HEARST
WAWA
CHAPLEAU
TIMMINS
KIRKLAND LAKE
Quebec
Lake Superior
SAULT STE. MARIE
SUDBURY
NORTH BAY
United States of America
ALGONQUIN PARK
PEMBROKE
PARRY SOUND
BANCROFT
KEMPTVILLE
Southern Region
Lake Huron
PETERBOROUGH
MIDHURST
AURORA
Lake Ontario
Lake Michigan
GUELPH
AYLMER
Lake Erie
N
Kilometres
0 50 100 200 300 400

Figure 1.1 Forest health work areas and Ontario Ministry of Natural Resources administrative regions and districts.

lists each tree by common name and provides the Latin name and the page reference(s) where the tree is mentioned in the text.

During aerial surveys an insect event is typically mapped as nil, light, moderate, or severe. These categories usually refer to the amount of defoliation to trees in a stand or forested area. They can also refer to other damage such as leaf mining, discoloration, skeletonising, or other insect signs or symptoms. The severity categories are defined as:

Category	**Severity**
Nil	0%
Light	1-25%
Moderate	26-75%
Severe	76-100%

The aerial survey is then followed-up with ground checks to verify the causal agent and to quantify the actual amount of damage. In most cases ground checks reveal that if the defoliation was visible from the air and could be aerially mapped, the severity level is at least 40% to 50% or higher. That is, even though defoliation may appear to be light or moderate from the air, if it is visible from the air it is usually at least 40% defoliation or higher. Also, in most cases some trees in the stand may be affected at the lower end of the moderate category, and some trees may be affected at the higher end of the severity category (e.g., 100%). Therefore, unless otherwise stated in this report, insect events mapped from the air are categorized as moderate-to-severe, meaning that defoliation severity ranged from 40% to 100%.

The resolution of the aerial mapping depends on where the event is in the province, the ease of delineating the boundaries of the event, the height at which the aircraft flies, and to some extent the mapping style of the individual technician (who may map at a fine scale with multiple polygons, or combine these into a few large polygons). For example, in southern Ontario where forested areas often have distinct boundaries, mapping is at relatively high resolution and is often done at the stand or sub-stand level. In northern Ontario, where stand boundaries are less distinct and some events can affect millions of hectares, mapping may be done at a relatively low resolution.

Thus in most cases especially in areas where forest lands are contiguous, the mapping polygons and resulting area figures represent a gross area rather than the net area. Unless otherwise stated, aerially mapped events and the number of hectares affected are described as the "area-within-which" the event occurred. The "area-within-which" is the gross area within which the insect, disease, or weather event is affecting the identified host species at the severity level indicated. Therefore, the "area-within-which" should be assumed to include non-forest land or forest lands of non-host species which were not affected by the insect or disease.

It's important to note that in 2006 the forest health program started a transition from sketching on hard copy paper maps, to using computer-based digital tablets for aerial mapping of insect, disease, and abiotic events. As a result the aerial maps are now of much higher resolution and accuracy. These improvements also mean that area estimates for these events are significantly less than would have been reported in previous years using sketch mapping. This change should be considered when comparing the amount area affected now to that affected prior to 2006.

In 2011, the forest health monitoring program received reports of forest health events that were detected and mapped by other parts of OMNR (e.g., district offices, fire management) or by forest industry. These reports were verified by the local forest health technician to confirm the identification and the aerial mapping. These occurrences are reported herein, and credited to originator of the report.

2011 SUMMARY OF EVENTS

Weather patterns

Ontario's weather during the 2011 growing season was relatively warmer and drier than in recent years. Normal temperatures occurred during May throughout most of the province. Northern Ontario and the far north were drier than normal. In contrast, southern Ontario had above normal precipitation with rainfall records being set in Hamilton (160 mm) and Kingston (139 mm).

June 2011 temperatures were again in the normal range for most of the province, with few storms in northern Ontario. By contrast, southern Ontario experienced several thunderstorms. During the week of June 4-9 thunderstorms moved across Ontario from Bruce County to the Ottawa Valley causing uprooted trees and downed power lines. During the week of June 21-24 another series of thunderstorms resulted in wind damage near Leamington as well as in the National Capital Region. This storm spawned an F0 tornado (the weakest on the Fujita Scale) near Ottawa.

Ontario experienced one of the hottest Julys on record in 2011 with mean monthly temperatures 2-3°C above normal. Many temperature records were set in southern and north central Ontario, including Windsor, Sarnia, Hamilton, Toronto, Chapleau, and Ellliot Lake. While Windsor received high levels of rainfall, parts of northern Ontario continued to experience another month of below average rainfall. The dry conditions resulted in several forest fires particularly in the far north of North West Region.

Similarly, August 2011 was both warmer and drier than normal, with most of Ontario having normal to above-normal mean temperatures especially in the far north. Lower precipitation was most notable in northern Ontario. In contrast, several areas in southern Ontario, especially Windsor and London, had above-normal precipitation.

Fall in Ontario was relatively warm and dry in 2011, with summer-like temperatures in much of the province in September. The warm weather continued into October with records being set in Chapleau, Dryden, and Geraldton.

Extreme weather events

Several extreme weather events in 2011 resulted in damage to the forest as well as to buildings and infrastructure. There were 17 tornadoes reported for the province, compared to an annual average of 13. The most powerful tornado to hit Ontario in 15 years was an F4 tornado on August 21 that struck Goderich. The tornado then moved inland approximately 20 km with a swath up to 1.5 km wide. This event damaged buildings and structures in the town, flattened forest areas along its track, and resulted in one death. Other tornadoes occurred near Gananoque, northwest of London, near Cambridge, in the southwest portion of Grey County, near Watford in eastern Lambton County, near Missinabie northeast of Wawa, and in the Goose Lake area of north western Ontario.

The dry weather in north western Ontario resulted in visible symptoms of severe drought. For the first time in several years the drought was widespread and continuous enough that it could be aerially mapped. Most of the affected area stretched from northeast of Sioux Lookout in a north westerly direction and affected forest stands on either side of Lac Seul. The affected area totalled 360,900 ha.

Insect infestations

The jack pine budworm (*Choristoneura pinus pinus* Free.) outbreak which began in 2004 and peaked 2007 continued its decline in 2011. Only small amounts of defoliation occurred in pockets in all three regions. The 2011 defoliation of 27,765 ha represented a 40% decline from the 2010 defoliation of 44,968 ha. Defoliation persisted in Sudbury and Timmins districts in North East Region, in Sioux Lookout District in North West Region, and in Parry Sound District in the Southern Region. Given the steady decline in recent years of the jack pine budworm outbreak, limited defoliation is expected in most of Ontario in 2012, although there may be some persistent pockets in all three regions.

This collapse is typical of outbreaks of this insect, which are characterized by 2-3 years of severe defoliation in a given area, followed by abrupt population collapses. The current outbreak began in Northeast Region in 2004, where it slowly built up over several years. In Northwest Region the outbreak began one year later and showed a rapid increase in defoliation. In both regions, defoliation in one area persisted for 2-3 years, with a collapse in one area being followed by a rise in defoliation in another part of the region. Overall, the Southern Region had much less defoliation, but like Northeast Region the populations here built up much more gradually than those in the Northwest. Peak defoliation occurred in 2007 when 740,116 ha of moderate-to-severe defoliation were aerially mapped. In Southern Region the jack pine budworm outbreak also has been quite localized, with severe defoliation in Algonquin Park and Bonnechere Provincial Park, and along the eastern shore of Georgian Bay east to Hwy. 69.

Spruce budworm (*Choristoneura fumiferana* Clem.) continued its oscillating outbreak which has been concentrated in Northeast Region. Moderate-to-severe defoliation affected 242,921 ha in 2011. This was a 40% decline from the 412,320 ha that occurred in 2010. In contrast, the 2010 defoliation was a 40% increase over the 291,592 ha that occurred in 2009. While this outbreak has continued for several years, the current spruce budworm defoliation has yet to erupt into a province-wide event such as the previous outbreak that peaked at over 18 million ha in 1981. Nonetheless, tree mortality has continued in the affected area in Northeast Region, with cumulative white spruce and balsam fir mortality reaching 182, 512 ha in 2011.

Forest tent caterpillar (*Malacosoma disstria* Hbn.) has cyclical outbreaks in Ontario, occurring approximately every 10-12 years. This insect is currently at endemic levels in most of the province with a new outbreak expected to begin in the next 2-3 years. Since 2009 forest tent caterpillar defoliation has occurred in Southern Region, but it has yet to erupt into a full outbreak. While the Southern Region defoliation began with 8,912 ha of moderate-to-severe defoliation north of Kingston in 2009, this area has not been defoliated since then. The 2009 defoliation was however followed by 60,427 ha of moderate-to-severe defoliation in 2010, and then by 54,623 ha of defoliation in 2011. In both 2010 and 2011 the defoliation occurred in pockets from Bancroft west to the Bruce Peninsula and Goderich. In most cases it was not the same stands being defoliated in each year. Thus it is not yet clear whether this represents the beginning of a full fledged provincial level outbreak.

Several other insects caused localized defoliation or damage in various parts of Ontario. In most cases, though, forest insect populations were relatively low compared to 2010. This is likely a result of the cool wet weather conditions in 2009 and 2010 that favoured tree growth and suppressed or slowed insect growth and phenology.

One exception was an extensive area of septoria leaf spot (*Septoria betulae* Pass.) and birch leaf skeletonizer (*Bucculatrix pometaria* (Harr.)) that resulted in premature yellowing and browning of the leaves of white birch. For the second year in a row, this late-season event occurred in Northwest Region. Almost all the white birch trees in the affected stands in the region had either or both septoria leaf spot or birch skeletonizer on the majority of their leaves.

Foliar diseases

The warm dry weather of 2011 did not favour foliar diseases, especially in comparison to 2009 when these events were prevalent enough that they could be mapped from the air for the first time. White pine browning was again observed in Ontario, but was much less prevalent than in previous years. Unlike 2009, white pine browning was not severe enough to be mapped from the air. The forest health program and the Ontario Forest Research Institute continued to work with the Canadian Forest Service – Laurentian Forestry Centre to identify the cause of this phenomenon.

Tree decline

In 2009 and 2010, aspen decline and mortality was recorded as a widespread event in Northwest Region. This damage was described as unhealthy-looking aspen with thin crowns, branch dieback, and in some cases tree mortality. In 2009 some 3,803,807 ha of aspen decline occurred from Fort Frances to Red Lake and Geraldton. In 2010 this increased to 12,767,043 ha of light aspen decline, and 3,114,134 ha of severe decline affecting all districts in the region. By 2011 however, aspen decline was no longer evident. Most of the aspen showed good recovery, with fully-leafed crowns and normal-sized leaves. Only 3,117 ha of severe aspen decline were aerially mapped in 2011. Aspen health plots were established in 2010 and 2011 to quantify the amount of decline and to determine the possible cause(s) of this phenomenon.

Invasive alien species surveys

Surveys for several invasive alien species continued in 2011. The exception was the delineation survey conducted since 2005 for sirex wood wasp (*Sirex noctilio* F.). This survey was not conducted in 2011. No new finds of this insect were made in the 2008 and 2009 surveys conducted by OMNR with the financial support of the Canadian Food Inspection Agency (CFIA). These surveys were conducted using Lindgren funnel traps baited with an alpha and beta pinene lure that is the best option currently available but known to be relatively poor at attracting sirex wood wasp. With the discontinuation of the CFIA support in 2010, OMNR conducted a project with the CFS to cut and rear pine logs from suspect trees. Suspect trees were cut from survey sites and placed in rearing cages and then monitored for emergence of sirex wood wasp. No sirex wood wasp adults were reared from these collections made in 2010 and monitored for sirex emergence until 2011. Because the suspect trees were cut in areas where the insect was thought to be at the leading edge of its distribution, it's not known whether the lack of any sirex wood wasps from the logs was because the trees were not infested, or whether the rearing method did not allow them to emerge.

Asian long-horned beetle (*Anoplophora glabripennis* Motschulsky) which was first discovered in the border area of Toronto and Vaughan in 2003 remained under an active eradication program. The aggressive survey and tree removal program under the authority of the CFIA has been followed-up by annual surveys by municipal staff to search for the beetle or for infested trees. This work has been done under the direction of the CFIA and with scientific guidance from a science panel chaired by the CFS. No Asian long-horned beetles or trees with signs or symptoms of infestation were found in 2011 surveys. This marks the fourth year of no new finds for this insect, indicating that the potential remains high for complete eradication.

In contrast, emerald ash borer (*Agrilus planipennis* Fairmaire) continued to spread and cause tree mortality. A single beetle was caught in a CFIA green prism trap baited with a green leaf volatile lure at two locations: near Sheguindah on Manitoulin Island, and near Wendover in Prescott and Russell County. Tree decline and mortality was aerially mapped in numerous pockets in south western Ontario resulting in a cumulative total from 2004-2011 of 62,616 ha. An additional 753 ha was aerially mapped for the first time in eastern Ontario in the Ottawa area.

Insect pest management programs

Only one insect pest management program was conducted by OMNR in 2011. The containment program for the pine shoot beetle (*Tomicus piniperda* (L.)), an invasive species from Europe, was continued in 2011, with 39 sites along the leading edge of the infestation. Population estimates from the bait logs, coupled with fall visual surveys for shoot attack, indicate the program has been successful in keeping the populations low with very few beetles (< 10) found at each site. Lindgren funnel trapping and visual surveys in 2011 and in previous years have not found pine shoot beetle north of this leading edge, indicating the insect remains contained to the south.

Forest Health Research Projects

Several research and health monitoring projects were undertaken in 2011 with the support of forest health field staff. Results of these projects are published as appropriate by the lead scientist, and are beyond the scope of this report. These projects included:

- In partnership with CFS-Northern Forestry Centre, annual monitoring of the CIPHA (climate change impacts on the productivity and health of aspen) plots in northern Ontario.
- Testing of detection methods for emerald ash borer.
- Testing of a detection method for European oak borer (*Agrilus sulcicollis* Lacordaire).
- Development of DNA methodology for identifying butternut trees resistant to butternut canker.
- Evaluating the optimum pheromone and trap type and placement for jack pine budworm.
- Provision of white pine logs for placement in mountain pine beetle (*Dendroctonus ponderosae* Hopkins) infested stands in Alberta to investigate the suitability and preference of white pine as a host for the beetle.
- Collection of jack pine foliage for a range-wide DNA analysis
- Collection of spruce budworm moths for range-wide DNA analysis
- Field testing of a pheromone for pine false webworm (*Acantholyda erythrocephala* (L.))

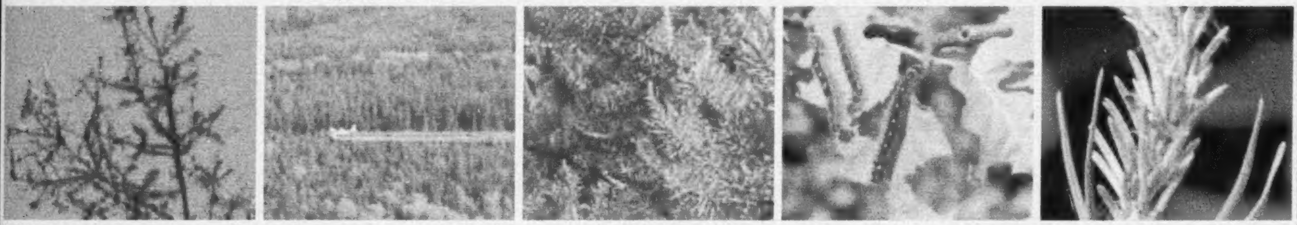
Major Forest Disturbances

M. Francis[1], P. Hodge[1], R. Lidster[1], S. McGowan[1], and S. Young[1]

[1] *Ontario Ministry of Natural Resources, Science and Information Branch, Inventory, Monitoring and Assessment Section, Sault Ste. Marie*

SECTION

2



FOREST INSECTS

Spruce budworm, *Choristoneura fumiferana* (Clem.)

Spruce budworm is one of the most destructive forest insects in North America and continues to cause moderate-to-severe defoliation of balsam fir, white spruce and black spruce in Northeast and Southern regions of Ontario. For over 60 years there has been some level of moderate-to-severe spruce budworm defoliation in the province (Figure 2.1).

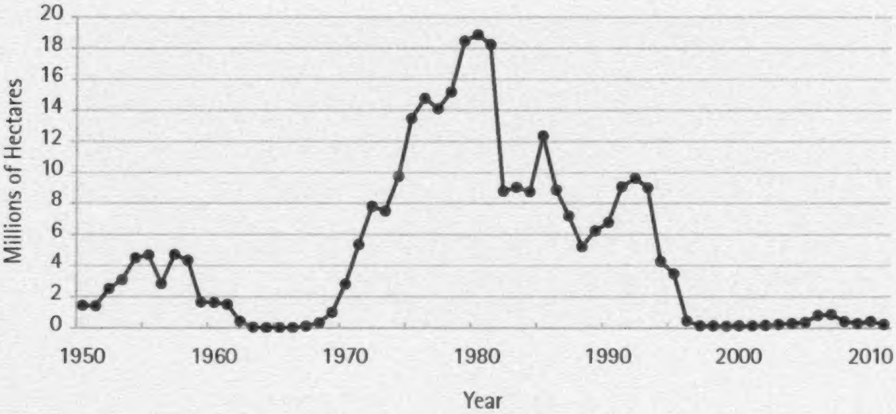


Figure 2.1 Spruce budworm moderate-to-severe defoliation in Ontario, 1950–2011.

In 2011, a total of 242,921 hectares (ha) of moderate-to-severe defoliation was recorded in the province (Figure 2.2). This represents a decrease of 41% compared to the 412,320 ha recorded in 2010. The majority of this defoliation occurred in Northeast Region with only 146 ha recorded in Southern Region.

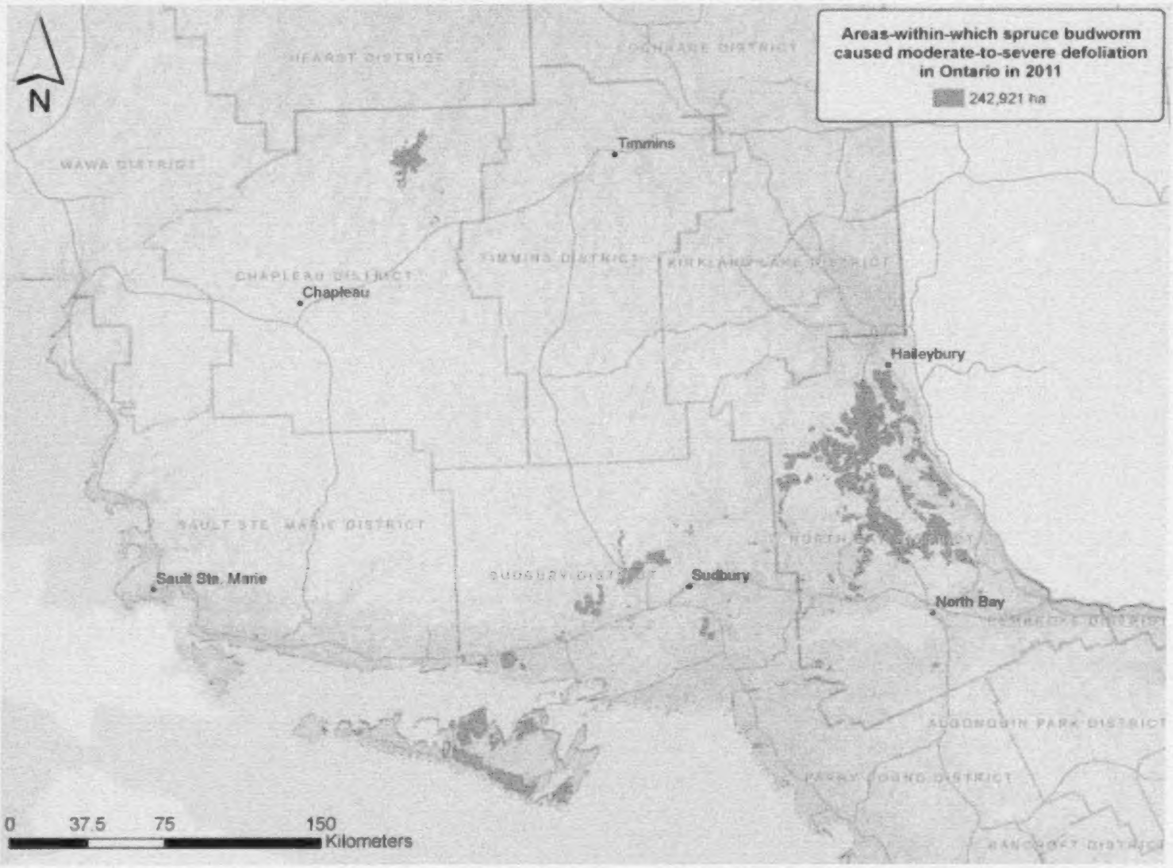

Areas-within-which spruce budworm caused moderate-to-severe defoliation in Ontario in 2011
▨ 242,921 ha
N
HEARST DISTRICT
COCHRANE DISTRICT
WAWA DISTRICT
Timmins
TIMMINS DISTRICT
KIRKLAND LAKE DISTRICT
CHAPLEAU DISTRICT
Chapleau
Haileybury
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
SUDBURY DISTRICT
Sudbury
NORTH BAY DISTRICT
North Bay
PEMBROKE DISTRICT
ALGONQUIN PARK DISTRICT
PARRY SOUND DISTRICT
BANCROFT DISTRICT
0
37.5
75
150
Kilometers

Figure 2.2 Areas-within-which spruce budworm caused moderate-to-severe defoliation in Ontario in 2011.

In Northeast Region, 242,775 ha of moderate-to-severe defoliation occurred in the four adjoining districts of North Bay, Sudbury, Sault Ste. Marie and Chapleau. Most of this defoliation was located in the southeast portion of the region stretching into north western Quebec. Moderate-to-severe defoliation by spruce budworm has been recorded in this general area for the last 10 consecutive years. The total area affected has varied widely, with no clear increasing or decreasing population trend in the last five years (Table 2.1).

In North Bay District, infestations have persisted for over 13 years, peaking in 2007 when 714,358 ha of moderate-to-severe defoliation were recorded. Since that peak a general decline in population has occurred with 156,405 ha of moderate-to-severe defoliation recorded in 2011.

The 2011 defoliation in North Bay District was observed further north and east of that recorded in 2010 on white spruce and balsam fir in the area of Lake Temagami. The 2011 defoliation stretched east to the Quebec border, north to the town of Cobalt, and south to Lake Nipissing. A few satellite pockets of defoliation were also noted in the southern portion of North Bay District in Falconer and Nipissing townships.

Table 2.1 Areas-within-which spruce budworm caused moderate-to-severe defoliation in Ontario, 2007-2011.

Region	Area of Defoliation (ha)				
District	2007	2008	2009	2010	2011
Northeast					
Chapleau	0	0	0	0	13,457
North Bay	714,358	306,069	164,919	124,588	156,405
Sault Ste. Marie	7,405	5,191	4,249	5,205	64
Sudbury	111,380	102,917	121,291	281,254	72,849
Sub total	833,143	414,177	290,459	411,047	242,775
Southern					
Algonquin	1,994	0	0	0	0
Bancroft	0	0	381	0	0
Kemptville	4,469	0	0	0	0
Midhurst	0	47	0	0	0
Parry Sound	2,217	4,121	644	1,164	0
Pembroke	7,222	303	0	0	0
Peterborough	0	81	101	109	146
Sub total	15,902	4,552	1,126	1,273	146
Provincial Total	**849,045**	**418,729**	**291,592**	**412,320**	**242,921**

In Sudbury District, infestations have persisted in the same general vicinity as in 2010. The 2011 defoliation has become fragmented, likely signifying a collapsing population. A total of 72,849 ha of moderate-to-severe defoliation was recorded in 2011. This represents a decrease of 74% from the 281,254 ha previously recorded in 2010. Almost half the total defoliation in Sudbury District occurred on Manitoulin Island from Lake Wosley east to the Owen Channel. The remainder of the defoliation was recorded in the central portion of Sudbury District from Massey to Capreol with a few pockets located south of Sudbury and west of Estaire in Secord and Laura townships.

In Chapleau District, a new area of moderate-to-severe defoliation was recorded east of Kapuskasing Lake in Lougheed, Shenango, Ossin and Wadsworth townships with scattered satellite pockets recorded southeast of this in Oates, Foleyet and Ivanhoe townships. Defoliation was predominantly on over-mature white spruce, totalling 13,457 ha in Chapleau District.

In Sault Ste. Marie District a major decline in defoliation occurred. The area affected decreased by almost 99%, with only 64 ha of moderate-to-severe defoliation recorded in Plummer Additional Township. Severe levels of defoliation were recorded on white spruce in this area along Thessalon River east of Rydal Bank. After six consecutive years of moderate-to-severe defoliation in the city of Sault Ste. Marie, populations collapsed in 2011. Only light defoliation on white spruce was recorded during ground surveys but this was not severe enough to identify and map from the air.

In Southern Region spruce budworm populations were observed in recurring satellite pockets in Peterborough and Bancroft districts (Figure 2.3). A total of 146 ha of moderate-to-severe defoliation was recorded on semi-mature white spruce plantation in east Eldon Township, Peterborough District. From this plantation a total of fifteen white spruce were assessed for defoliation resulting in 69% of foliage affected. Light defoliation was recorded in scattered pockets on white spruce at Balsam Lake Provincial Park, Peterborough District and along Hwy. 28, Kawartha Township, Bancroft District.

Figure 2.3 Spruce budworm feeding on white spruce in Bancroft District (photo by P. Hodge).

After 3-5 consecutive years of moderate-to-severe spruce budworm defoliation, top-kill and whole-tree mortality can occur in both balsam fir and white spruce. In Northeast Region a total of 2,481 ha of white spruce and balsam fir mortality was recorded, almost all of which occurred in North Bay District (Figure 2.4). This brought the total cumulative spruce budworm mortality in the region (and the province) to 182,512 ha for the years 1997-2011.

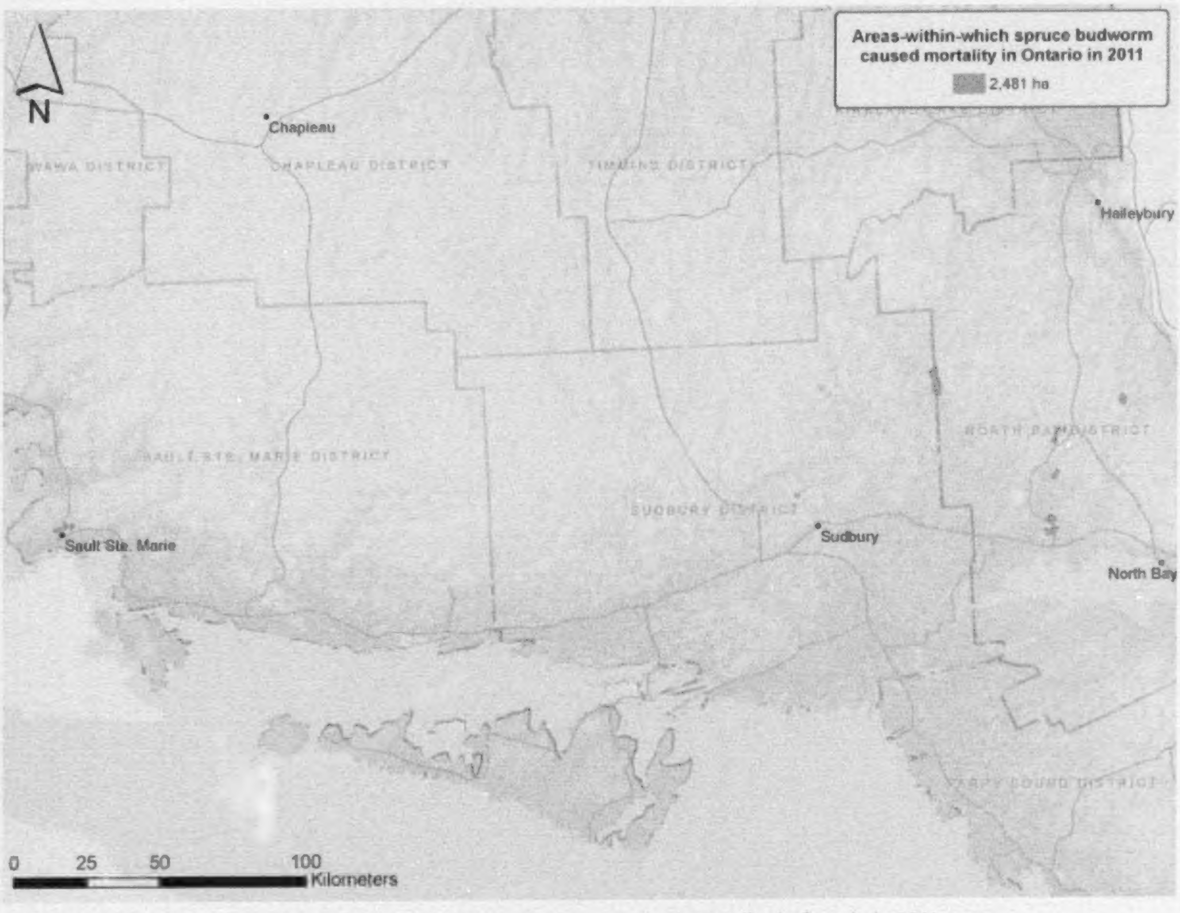

Areas-within-which spruce budworm caused mortality in Ontario in 2011
▨ 2,481 ha
N
Chapleau
WAWA DISTRICT
CHAPLEAU DISTRICT
TIMMINS DISTRICT
Haileybury
NORTH BAY DISTRICT
SAULT STE. MARIE DISTRICT
SUDBURY DISTRICT
Sudbury
Sault Ste. Marie
North Bay
PARRY SOUND DISTRICT
0
25
50
100
Kilometers

Figure 2.4 Areas-within-which spruce budworm caused mortality in Ontario in 2011.

In North Bay District 2,353 ha of white spruce and balsam fir mortality was recorded in 2011 bringing the cumulative total in this district from 1997-2011 to 113,811 ha. Mortality was mapped east of Field in Springer, Field, Grant and Bastedo townships in the Tomiko Lake area. Four smaller pockets of mortality were mapped on the east side of Red Cedar Lake in McCallum and Sisk townships. A satellite pocket consisting of moderate levels of mortality was mapped at the northeast end of Wicksteed Lake, Flett Township and a larger pocket was also mapped on the east side of the Sturgeon River in Sturgeon River Provincial Park, Sheppard and Afton townships.

In Sault Ste. Marie District white spruce mortality caused by six consecutive years of spruce budworm defoliation was mapped around the city of Sault Ste. Marie in 2011 (Figure 2.5). Mortality of semi-mature and over-mature white spruce was observed in the north end of the city, north and south of 5th Line near the Root River Golf Course along Coldwater Creek. Total area of mortality recorded in the district in 2011 was 95 ha.

In Sudbury District a small pocket of mortality measuring 33 ha in size was recorded in Blezard Valley, northeast of Val Caron, Greater Sudbury.

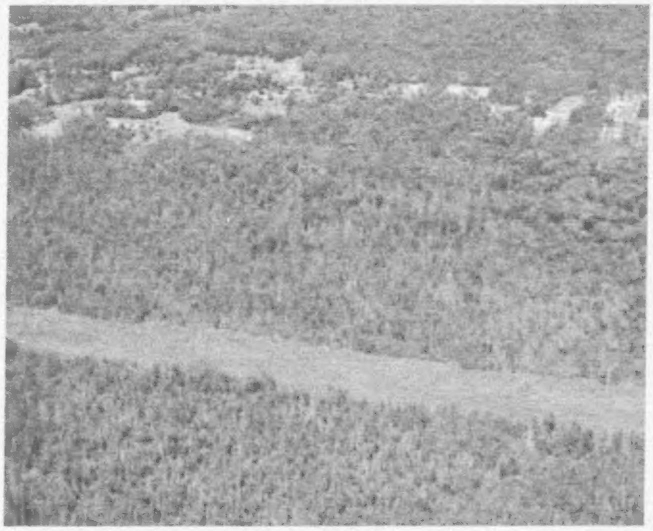


Figure 2.5 White spruce mortality caused by spruce budworm, Sault Ste. Marie District (photo by M. Francis).

Jack pine budworm, *Choristoneura pinus pinus* Free.

Jack pine budworm is a native forest pest. Over the past 60 years periodic outbreaks have developed resulting in widespread defoliation (Figure 2.6)

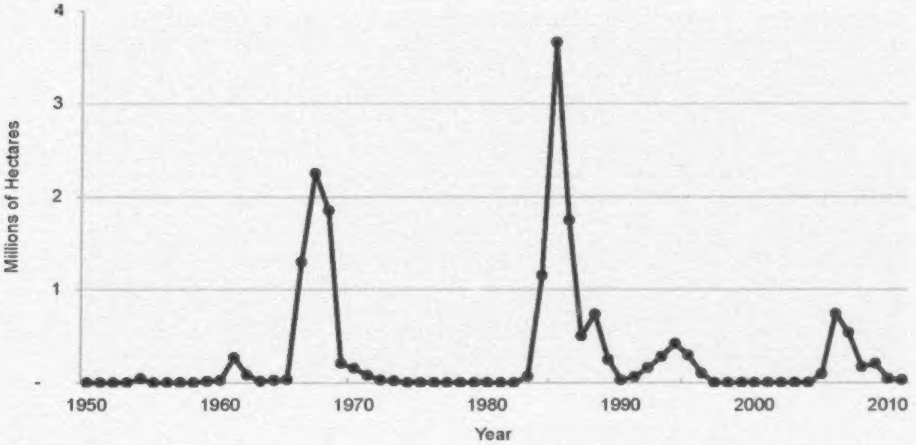


Figure 2.6 Jack pine budworm moderate-to-severe defoliation in Ontario, 1950-2011.

Jack pine is the preferred host of jack pine budworm. The insect also feeds on eastern white pine and red pine in Ontario.

The current outbreak in Ontario began in 2004 with defoliation by this insect occurring each year since. Peak defoliation was in 2006 when 740,116 ha of moderate-to-severe defoliation were mapped. The outbreak has declined steadily since then. This overall trend continued in 2011, for which a total of 27,765 ha of moderate-to-severe defoliation was aerially mapped, a decrease of 38% from 2010 (Table 2.2).

Table 2.2 Areas-within-which jack pine budworm caused moderate-to-severe defoliation in Ontario, 2007-2011.

Region	**Area of Defoliation (ha)**				
District	2007	2008	2009	2010	2011
Northeast					
Chapleau	0	0	98	23	0
North Bay	306	0	195	3	0
Sault Ste. Marie	2,502	2,356	0	0	0
Sudbury	42,775	4,092	2,426	14,667	1,793
Timmins	4,228	20,240	6,682	365	1,048
Sub total	49,811	26,688	9,401	15,058	2,841
Northwest					
Dryden	178,881	0	267	41	0
Fort Frances	41,020	0	0	0	0
Kenora	227,210	12,292	0	0	0
Red Lake	6,783	115,041	147,204	1,633	0
Sioux Lookout	9,065	7,926	7,350	3,987	6,904
Thunder Bay	892	0	0	0	0
Sub total	463,851	135,259	154,821	5,660	6,904
Southern					
Algonquin Park	185	1,484	1,703	350	451
Parry Sound	21,674	4,760	39,701	23,762	17,537
Pembroke	530	262	75	138	32
Sub total	22,389	6,506	41,479	24,249	18,021
Provincial Totals	**536,051**	**168,453**	**205 ,701**	**44,968**	**27,765**

All three regions had defoliation recorded in 2011 with the majority of defoliation observed in Southern Region. Northeast and Southern regions had a decrease in area of defoliation in 2011 (Figure 2.7), while Northwest Region had a slight increase (Figure 2.8).

In Southern Region jack pine budworm defoliation was mapped in Parry Sound, Pembroke and Algonquin Park districts in 2011. The majority of this was in Parry Sound District with small pockets in Pembroke and Algonquin Park districts.

For the past five years, defoliation levels in Parry Sound District have fluctuated up and down in an area between Hwy. 69 and Georgian Bay in the northwest corner of the district. In 2011 the amount of moderate-to-severe defoliation in Parry Sound District dropped to

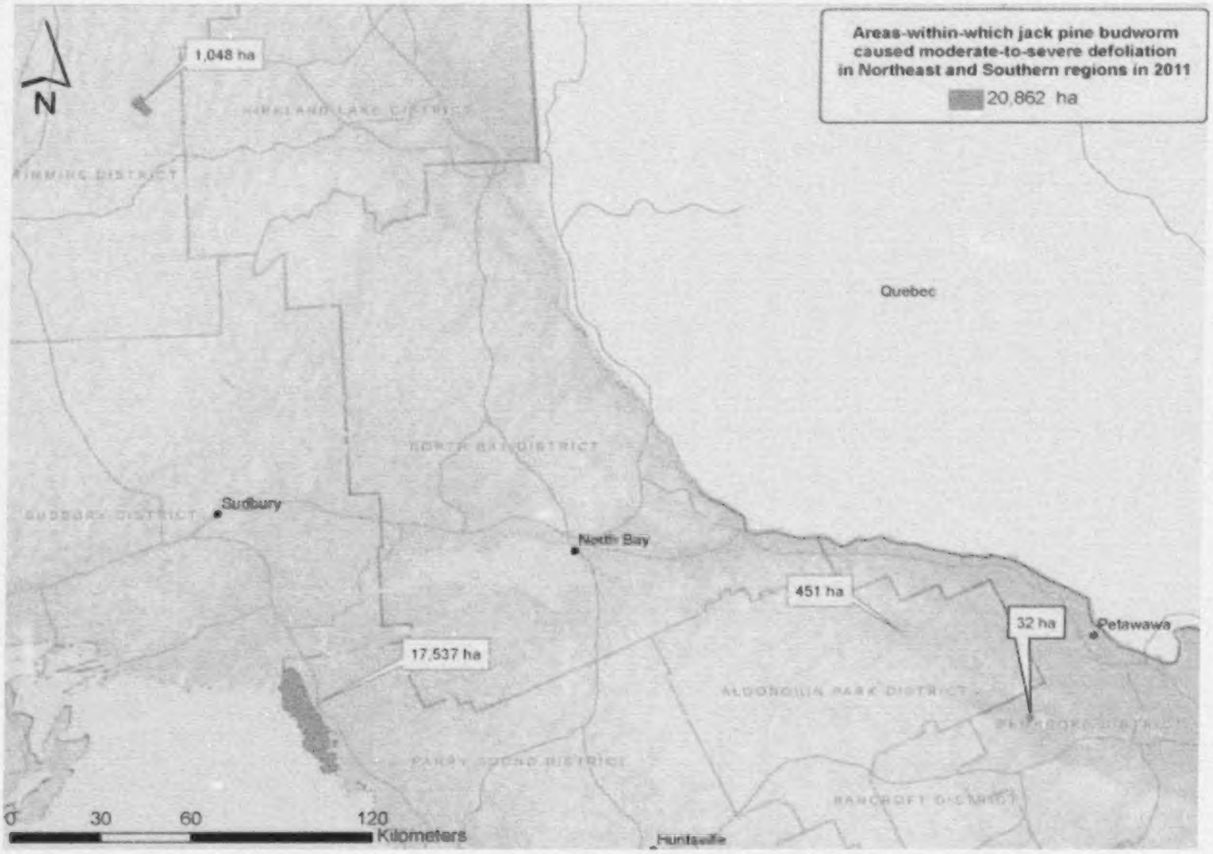

Areas-within-which jack pine budworm caused moderate-to-severe defoliation in Northeast and Southern regions in 2011
▨ 20,862 ha
N
1,048 ha
KIRKLAND LAKE DISTRICT
TIMMINS DISTRICT
Quebec
NORTH BAY DISTRICT
SUDBURY DISTRICT
Sudbury
North Bay
451 ha
32 ha
Petawawa
17,537 ha
ALGONQUIN PARK DISTRICT
PEMBROKE DISTRICT
PARRY SOUND DISTRICT
BANCROFT DISTRICT
0 30 60 120 Kilometers
Huntsville

Figure 2.7 Areas-within-which jack pine budworm caused moderate-to-severe defoliation in Northeast and Southern regions in Ontario in 2011.

17,537 ha north of French River Provincial Park and south along the shoreline of Georgian Bay to Point au Baril.

In the northeast portion of Algonquin Park District, 451 ha of moderate-to-severe defoliation were mapped just south of Lake Traverse, a slight decrease from 2010. This is the fifth consecutive year of defoliation to jack pine in this area.

In Bonnechere Provincial Park, Pembroke District, moderate-to-severe defoliation occurred on jack pine and eastern white pine, totalling 63 ha. Defoliation in this area continued its declining trend in 2011, but whole-tree mortality has begun to appear as a result of previous years' defoliation.

The total moderate-to-severe jack pine budworm defoliation in 2011 in Southern Region was 18,021 ha.

In Northeast Region a total of 2,841 ha of moderate-to-severe defoliation was recorded in Timmins and Sudbury districts in 2011. This was a significant decrease in defoliation in the region compared to 2010. This major decrease in defoliation occurred in Sudbury District, whereas Timmins District experienced an increase in area of mapped defoliation.

In 2011 jack pine budworm defoliation declined by 12,874 ha in Sudbury District. The area of defoliation was still confined in the southern portion of the district and a part of a larger area in Parry Sound District, Southern Region. A total of 1,793 ha of moderate-to-severe defoliation was recorded just north of Tower Lake and extended south to Georgian Bay within French River Provincial Park and southeast into Parry Sound District, Southern Region.

In the central portion of Timmins District 1,047 ha of moderate-to-severe defoliation were observed in the northeast portion of Kemp Township, as far south as Grassy Lake, extending north along Grassy River into Loonwing Lake, south Sothman Township. This was the second consecutive year jack pine budworm was mapped in this area in a large stand of young jack pine.

In Northwest Region, the only moderate-to severe defoliation which were aerially mapped in 2011 was in Sioux Lookout District. Light defoliation was observed in Dryden District during ground-based surveys but could not be detected and mapped from the air. By comparison, when the outbreak peaked in 2007 moderate-to-severe defoliation was recorded in all districts in the region except Nipigon District.

A total of 6,904 ha of moderate-to-severe defoliation was aerially mapped in the central portion of Sioux Lookout District in 2011. Three pockets of defoliation were recorded north of

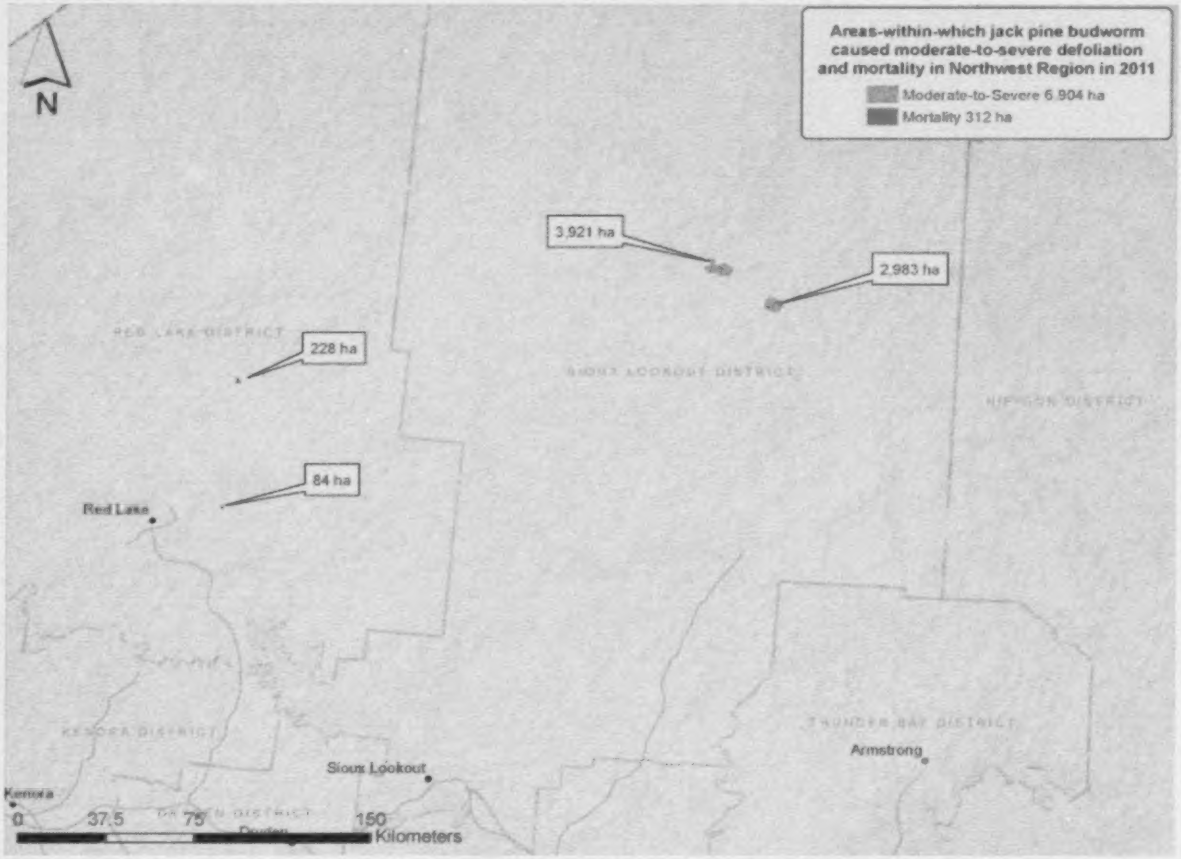

N
Areas-within-which jack pine budworm caused moderate-to-severe defoliation and mortality in Northwest Region in 2011
Moderate-to-Severe 6,904 ha
Mortality 312 ha
3,921 ha
2,983 ha
228 ha
84 ha
RED LAKE DISTRICT
SIOUX LOOKOUT DISTRICT
NIPIGON DISTRICT
KENORA DISTRICT
DRYDEN DISTRICT
THUNDER BAY DISTRICT
Red Lake
Sioux Lookout
Armstrong
Kenora
Dryden
0
37.5
75
150
Kilometers

Figure 2.8 Areas-within-which jack pine budworm caused moderate-to-severe defoliation Northwest Region in Ontario in 2011.

the community of Pickle Lake along Hwy. 808 between Menako Lakes to the southwest end of Pipestone River Provincial Park. The largest pocket was partially in the park just southwest of Nigras Lakes and bisected by Hwy. 808. A slightly smaller pocket of defoliation was mapped south of the above-mentioned defoliation between Dowden Lake and Menako Lakes, also divided by Hwy. 808. In addition to this, a small pocket of moderate-to-severe defoliation was situated on the west side of the highway, south of the Pipestone River.

The light defoliation in 2011 in Dryden District occurred in several pockets around Daniels Lake (Figure 2.9). Light-to-moderate defoliation was mapped in the same area in 2010.

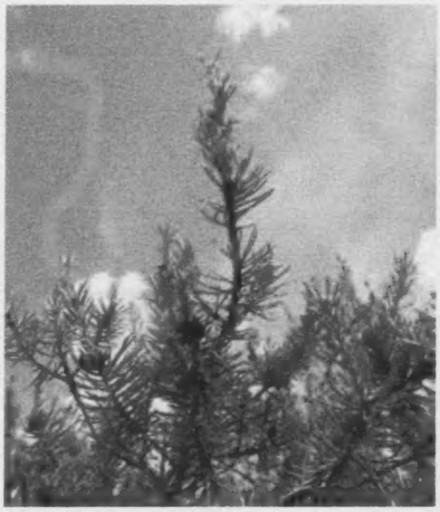


Figure 2.9 Light levels of jack pine budworm defoliation on young jack pine, Dryden District (photo by S. Young).

A total of 1,575 ha of new jack pine mortality caused by jack pine budworm was aerially mapped in Ontario in 2011. Over 80% of this mortality was recorded in Southern Region with small pockets recorded in Northwest Region.

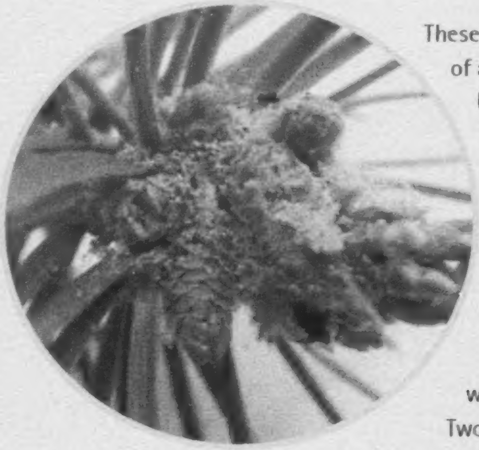
In 2011 a total of 1,263 ha of new jack pine mortality was recorded in Southern Region in Parry Sound and Pembroke districts. The majority of the mortality (1,233 ha) was observed in Parry Sound District in and north of Henvey Township to the southern boundary of French River Provincial Park along Georgian Bay. Moderate-to-severe jack pine budworm defoliation has been mapped in this general area since 2006, resulting in top-kill and whole-tree mortality.

Since 2006 moderate-to-severe defoliation has also been recorded in and around Bonnechere Provincial Park, Pembroke District. In 2011, 32 ha of jack pine mortality was aerially mapped in this area along with top-kill to over-mature jack pine trees.

After four consecutive years of moderate-to-severe defoliation, new jack pine mortality was detected in Red Lake District, Northwest Region in 2011. The mortality in Red Lake District was mapped in three small pockets; two located just north of Nungesser Lake and the third on the south end of Trout Lake east of the town of Red Lake. The two areas north of Nungesser Lake were an expansion of mortality mapped in 2010 along the smaller Pringle Lake near Windfall Creek. The third, smaller, pocket of mortality was a new area of dead jack pine mapped in Trout Lake Provincial Nature Reserve. These three pockets of mortality totalled 312 ha.

Jack Pine Forest Health Plots

In the mid 1990's, jack pine plots were established across Northeast and Northwest regions of Ontario to monitor and study the impacts of jack pine budworm. In 2000, the focus of these plots was revised to include the health of jack pine forests across northern Ontario.



These permanent sample plots are monitored annually independent of any jack pine budworm infestation. Thus the results described below are for the permanent sample plots only. They do not necessarily reflect the impacts of the current jack pine budworm outbreak except where the plots are within the budworm infestation.

A total of 122 plots, comprising 6,100 trees (58 plots in Northeast Region, 64 plots in Northwest Region) were assessed in 2011. The trees were rated for the presence of any insect, disease or abiotic factors that affect jack pine as well as the abundance of male (pollen) flowers (Figure 2.10). Two plots in Northeast Region were not assessed in 2011 as they were not accessible due to road reconstruction.

Figure 2.10 Early stages of jack pine budworm populations depend on the male pollen flowers to develop. This early instar larva feeds on jack pine flowers (photo by S. Young).

In 2011, jack pine tree condition in the plots was similar in both Northeast and Northwest regions in Ontario. The majority of the trees had less than 60% total defoliation of old and current foliage (Table 2.3). Slightly higher levels of total defoliation were recorded in Northwest Region.

Table 2.3 Condition of all trees in jack pine forest health plots in Ontario, 2011.

Region	Tree Condition (% of trees)					
	Total defoliation (%)				Mortality	
	<25	25-50	51-75	>75	New	Old
Northeast (n=2900)	50.8	11.3	1.9	1.2	1.5	33.3
Northwest (n=3200)	44.1	16.1	3.3	1.3	2.5	32.8

There were 79 jack pine trees within the plots that died in 2011 in Northwest Region, 24 from armillaria root rot and 21 from severe wind events. These wind events caused 5,061 ha of total damage in Northwest Region to all boreal tree cover including jack pine (Figure 2.18). The remaining tree mortality within the plots was caused by whitespotted sawyer beetle (*Monochamus scutellatus* (Say)), snow or ice, western gall rust, bark beetles, or a combination of the above factors.

A total of 44 jack pine plot trees in Northeast Region died in 2011. Almost a third of this mortality was caused by armillaria root rot. The rest of the mortality was attributed to western gall rust (*Endocronartium harknessii* (J.P. Moore) Y. Hirats.), sweet fern blister rust (*Cronartium comptoniae* Arthur) and blowdown.

The crowns of the jack pine trees were relatively healthy in both regions in 2011 (Table 2.4).

Table 2.4 Condition of all tree tops and abundance of flowers of live trees in jack pine forest health plots in Ontario, 2011.

Region	Tree Condition (% of trees)						
	Tree Top			Abundance of Flowers			
	Live	Bare	Dead	Nil	Light	Moderate	High
Northeast (n=1890)	96.7	0.7	2.6	4	32	22	42
Northwest (n=2072)	98.1	1.1	0.8	16	33	13	38

Surveys revealed a significant increase in jack pine male flower abundance in 2011. Declining jack pine budworm infestations in Northeast and Northwest regions have resulted in a resurgence of male flowers. In Northwest Region over 50% of the live jack pine trees assessed in 2011 had moderate-to-high levels (10 to 20 flower clusters per branch (moderate) or >20 flower clusters per branch (high)) of male flowers compared to 28% in 2010. In Northeast Region the jack pine male flowers increased again in 2011 as 64% of the trees assessed had moderate-to-high levels, slightly higher than the 58% recorded in 2010.

In 2011 there was no jack pine budworm defoliation in Northeast Region while average defoliation in Northwest Region was 0.21%. A total of 16 plots in Northwest Region had some level of jack pine budworm defoliation; the highest average defoliation was recorded northeast of Kenora near John Lake in plot 132 at 3.8%.

Other forest health factors affecting jack pine recorded during the assessment were western gall rust, sweet fern blister rust and abiotic factors such as drought, blowdown and snow damage. The most common of these in both regions was western gall rust. A total of 1056 trees had some level of gall rust, 600 jack pine in Northeast Region and 458 in Northwest Region. This translates to 32% of the trees affected in Northeast Region and 22% in Northwest Region. The majority of the western gall rust in Northeast Region was light in severity. In Northwest Region 47% of the live jack pine also had light damage by western gall rust.

Forest tent caterpillar, *Malacosoma disstria* Hbn.

Forest tent caterpillar is the most common defoliator of hardwood trees in North America (Figure 2.11).

In northern Ontario this native pest prefers trembling aspen and large tooth aspen, but can also be found on balsam poplar and white birch. In southern Ontario the preferred host is oak and sugar maple but larvae can also be found defoliating many other hardwoods, with the exception of red maple. Forest tent caterpillar was first reported causing defoliation in Canada in 1835. This insect undergoes periodic outbreaks

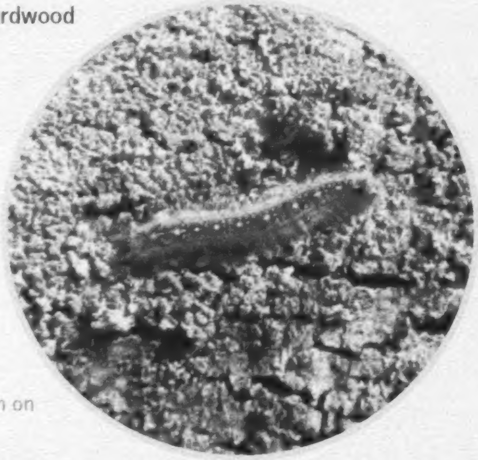


Figure 2.11 Mature forest tent caterpillar larva amongst lichen on sugar maple (photo by P. Hodge).

Marie east to Sudbury, North Bay, and Mattawa. An isolated infestation has persisted for several years on bur oak within the town of New Liskeard. No infestations have been found elsewhere in this part of Northeast Region where bur oak grows to the northern extent of its range. Similarly, no infestations have been found in Northwest Region where bur oak grows in a band along the southern portion of the region from Thunder Bay west along the U.S. border.

Since 1981, gypsy moth has caused periodic moderate-to-severe defoliation in Ontario, with major outbreaks peaking in 1985, 1991 and 2002 (Figure 3.14). The most recent outbreak was much less severe than previous ones, peaking in 2008 at 39,476 ha of moderate-to-severe defoliation (Table 3.3). In 2009 and 2010, unfavourable conditions for the insect consisting of moist, cool spring and early summer weather allowed for rapid proliferation of the fungus *Entomophaga maimaiga* (Humber, Shimazu & R.S. Soper). The fungus caused a collapse of the gypsy moth population such that no defoliation could be aerially mapped in 2010 or 2011. This marks the first and second years since 1981 that no gypsy moth defoliation was aerially mapped in Ontario.

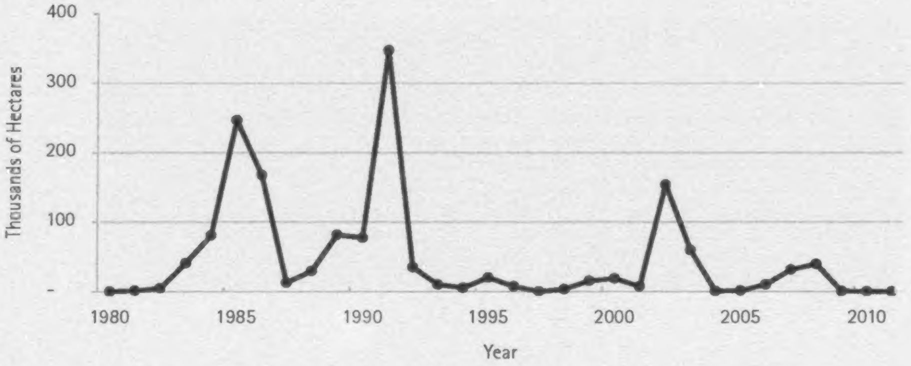


Figure 3.14 Gypsy moth moderate-to-severe defoliation in Ontario, 1981-2011.

Table 3.3 Cumulative area of moderate-to-severe defoliation caused by gypsy moth in Ontario 2007-2011

Region	**Area of Defoliation (ha)**				
District	**2007**	**2008**	**2009**	**2010**	**2011**
Northeast					
Sault Ste. Marie	0	1,212	0	0	0
Sudbury	0	15,507	0	0	0
Sub total	0	16,719	0	0	0
Southern					
Aurora	1,474	2,292	0	0	0
Aylmer	4,064	6,854	84	0	0
Guelph	25,556	11,136	97	0	0
Midhurst	0	2,459	204	0	0
Peterborough	0	16	0	0	0
Sub total	31,094	22,757	385	0	0
Provincial Total	**31,094**	**39,476**	**385**	**0**	**0**

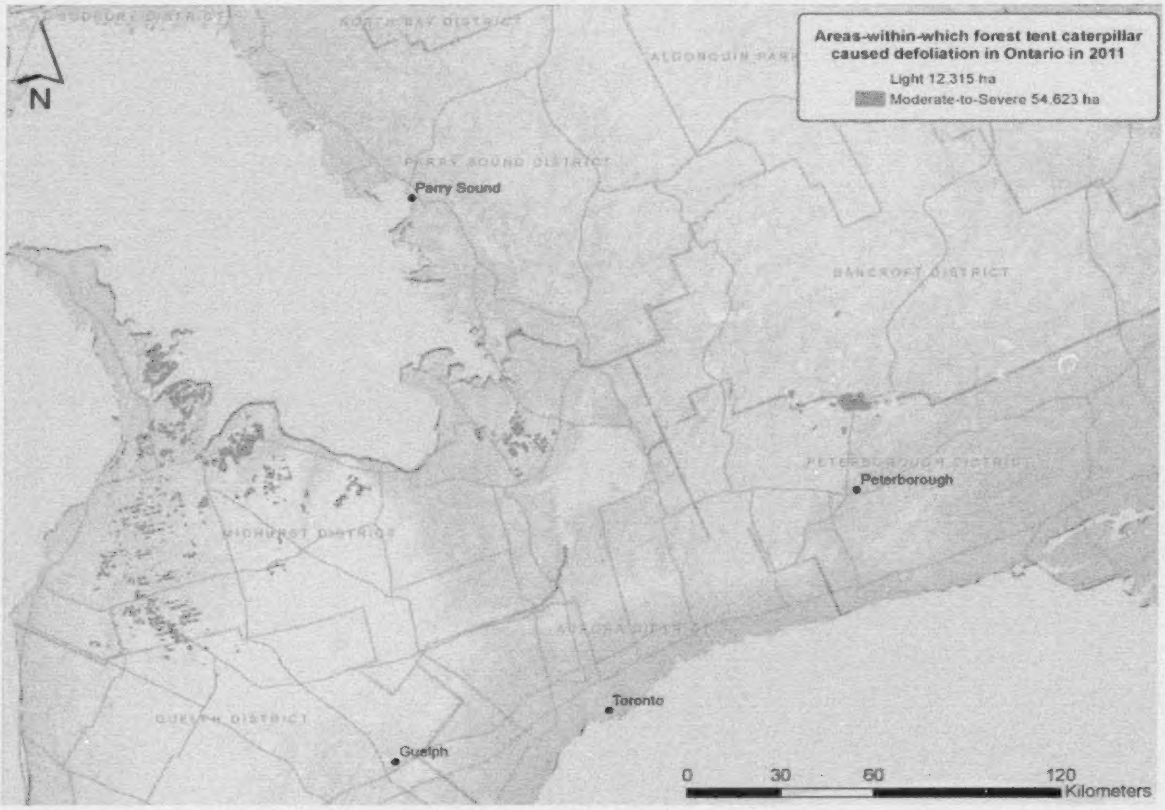

N
SUDBURY DISTRICT
NORTH BAY DISTRICT
ALGONQUIN PARK
Areas-within-which forest tent caterpillar caused defoliation in Ontario in 2011
Light 12,315 ha
Moderate-to-Severe 54,623 ha
PARRY SOUND DISTRICT
Parry Sound
BANCROFT DISTRICT
PETERBOROUGH DISTRICT
Peterborough
MIDHURST DISTRICT
AURORA DISTRICT
Toronto
GUELPH DISTRICT
Guelph
0
30
60
120
Kilometers

Figure 2.13 Areas-within-which forest tent caterpillar caused defoliation in Ontario in 2011.

An additional 12,315 ha of light defoliation were also mapped in Southern Region in the same general area of moderate-to-severe defoliation in 2010, suggesting a possible collapse in those areas. The majority of this light defoliation was in Bancroft District (8,781 ha) with smaller areas in Guelph, Midhurst and Peterborough districts.

In Northeast Region forest tent caterpillar larvae were observed at low population levels during ground-based surveys in Sault Ste. Marie District, but there was no discernible defoliation.

In Midhurst District, Southern Region, a total of 48,246 ha of moderate-to-severe defoliation was recorded in the western and north-eastern portions of the district.

This defoliation more than doubled what was recorded in this district in 2010 with infestations expanding in 2011 and extending out to many new locations. On the west side of the district larger contiguous forested areas were defoliated by forest tent caterpillar in Meaford, east of Owen Sound to the southeast side of Bruce Peninsula, Bruce County. Smaller pockets of moderate-to-severe defoliation were also reported in Bruce County in the areas of Paisley, Walkerton and north of Wingham. Several other small pockets were located southeast of Owen Sound between the towns of Chatsworth and Collingwood, Grey County. In the northeast portion of Midhurst District moderate-to-severe defoliation was observed north of the town of Midhurst in Oro-Medonte Township, as well as southwest of Orr Lake, Springwater Township (Figure 2.14).

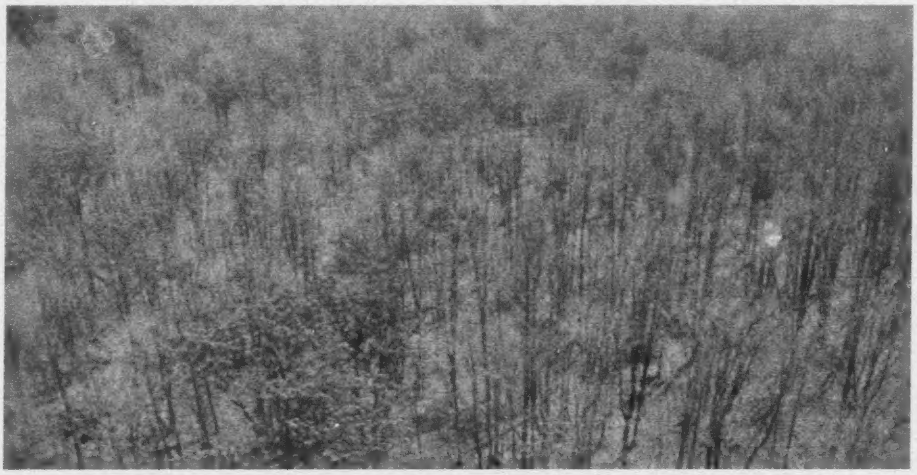


Figure 2.14 Severe forest tent caterpillar defoliation on sugar maple in Midhurst District (photo by P. Hodge).

A total of 1,412 ha of light defoliation was recorded in Midhurst District in the Wiarton area and in smaller woodlots further south adjacent to Huron County, Aylmer District.

In Owen Sound area, forest tent caterpillars were frequently found to have been killed by the nuclear polyhedrosis virus (NPV) or the fungus *Furia gastropachae* (Racib. S. Kel). However this mortality did not occur before the insect managed to completely defoliate the overstory trees (Figure 2.15).

The parasitic large flesh fly (*Arachnidomyia (=Sacophaga) aldrichi* (Parker)) was present through most of the district as well.

In Bancroft District a total of 3,769 ha of moderate-to-severe defoliation was mapped in the southwest portion of the district. This was a considerable decline in the amount of defoliation mapped from the previous year as 30,074 ha of moderate-to-severe defoliation was recorded in 2010. The majority of defoliation occurring in 2011 was seen in Harvey Township north of Lower Buckhorn Lake with scattered pockets north of Bobcaygeon in Galway-Cavandish Township. In addition, a total of 8,781 ha of light defoliation was recorded in the same general area.

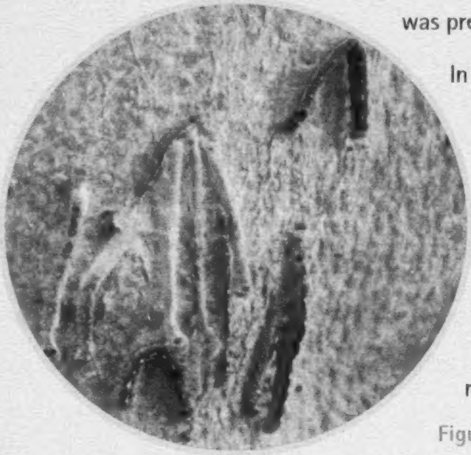


Figure 2.15 Forest tent caterpillar larvae infected by NPV and fungus *Furia gastropachae* (photo by S. McGowan).

A large pocket of moderate-to-severe defoliation was mapped between Upper Chemong Lake and Buckhorn Lake with smaller pockets noted between Lower Buckhorn Lake and Clear Lake and on the southwest end of Big Island in Pigeon Lake. Light defoliation totalling 2,069 ha was also mapped in the same general area. Proliferation of NPV also occurred in Peterborough District resulting in widespread forest tent caterpillar larval mortality (Figure 2.15). The large flesh fly was also commonly observed in infested areas where forest tent caterpillar caused defoliation in 2010. These two biological factors likely reduced the amount of defoliation seen in 2011.

In Guelph District, 921 ha of moderate-to-severe defoliation were mapped in the northwest corner of the district. This was an extension of the defoliation seen in Midhurst District as several pockets of defoliation were recorded between the towns of Wingham and Palmerston in Howick and Minto townships. Another small pocket of moderate-to-severe defoliation was recorded northeast of Stratford in Hope Township.

In Northeast Region, low levels of forest tent caterpillar were recorded on trembling aspen in Sault Ste. Marie District, but no defoliation was observed in 2011. The last time defoliation was recorded in the district was 2003 when defoliation occurred in the city of Sault Ste. Marie, at Lauzon Lake, and in Wells Township along Melwel Road.

FOREST DISEASES

Brown spot needle blight, *Mycosphaerella dearnessii* M.E. Barr (Anamorph: *Lecanosticta acicola* (Thümen) H. Sydow)

Brown spot needle blight was aerially mapped in several locations in Southern and Northeast regions of Ontario in 2011. This disease of pines was mainly affecting Scots pine plantations or hedgerows in Southern Region with two separate detections made on eastern white pine.

In the spring of 2011 many parts of the province had high levels of precipitation which promoted development of brown spot needle blight infection and spore dispersal. In total 1,536 ha of moderate-to-severe damage was aerially mapped in Parry Sound, Midhurst, Bancroft and Sault Ste. Marie districts (Figure 2.16).

In Southern Region the majority of brown spot needle blight damage was recorded in Parry Sound District. A total of 1,346 ha of moderate-to-severe damage was confirmed in several Scots pine plantations in the eastern side of Parry Sound District north of Sundridge stretching south to Bracebridge. Affected plantations were located in Muskoka Lakes, Armour, Joly, and Machar townships, and areas within the geographic boundaries of the towns of Kearney, Huntsville, and Bracebridge.

In Midhurst District, Southern Region, brown spot needle blight caused 61 ha of moderate-to-severe damage in 2011. Several small Scots pine plantations containing the brown spot needle blight fungi (Figure 2.17) were observed in the northeast portion of the district from the eastern border of Bancroft District to just west of Penetanguishene which included Rama, Medonte, Tay, Tiny, Flos and Vespra townships and the towns of South Bruce Peninsula and Orillia.

In Bancroft District approximately 26 ha of moderate-to-severe damage was aerially mapped within a single plantation just west of Queen Elizabeth II Wildlands Provincial Park on Sadowa Road and Kett Road, within the city of Kawartha Lakes.

In Northeast Region brown spot needle blight was aerially mapped on St. Joseph Island, Sault Ste. Marie District. Five small pockets of moderate-to-severe damage from this needle disease were observed in the southern portion of the island totalling 100 ha. All five

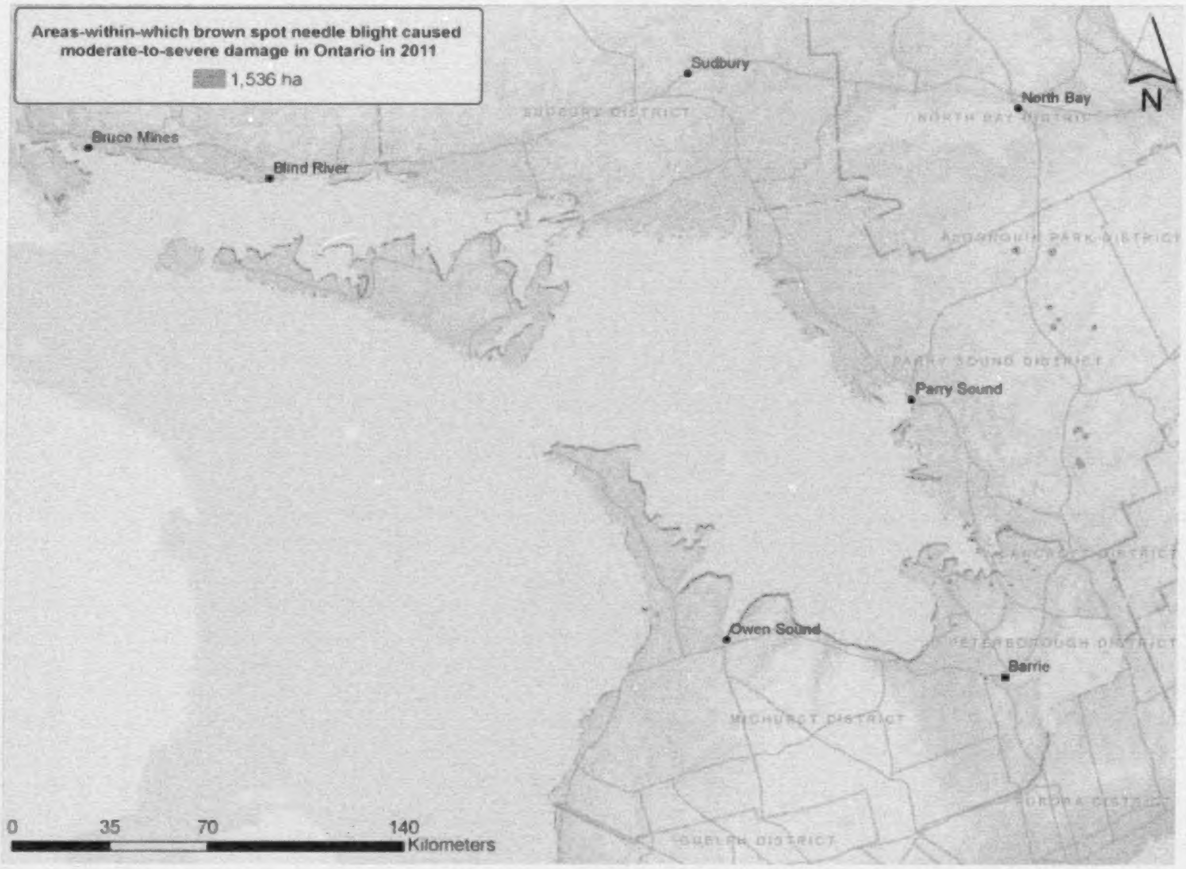

Areas-within-which brown spot needle blight caused moderate-to-severe damage in Ontario in 2011
1,536 ha
Sudbury
North Bay
N
Sudbury District
North Bay District
Bruce Mines
Blind River
Algonquin Park District
Parry Sound District
Parry Sound
Bancroft District
Owen Sound
Peterborough District
Barrie
Midhurst District
Aurora District
Guelph District
0
35
70
140
Kilometers

Figure 2.16 Areas-within-which brown spot needle blight caused moderate-to-severe damage in Ontario in 2011.

pockets were Scots pine plantations in the area of 2nd Concession and Reed's Road, Jocelyn Township (Figure 2.18).

Figure 2.17 Scots pine plantation infected with brown spot needle blight in Midhurst District (photo by P. Hodge).

Figure 2.18 Hedgerow of mature Scots pine infected with brown spot needle blight (photo by M. Francis).

Incidental infections of brown spot needle blight were also collected on two separate occasions from eastern white pine in Pansy Patch Park, Pembroke District and in a Scots pine stand on Kimberly Drive, Kemptville District. Pre-mature needle drop was noted within the plantation along with a high rate of infection on the majority of the remaining foliage.

FOREST ABIOTIC EVENTS

Blowdown

Blowdown occurred in all three regions of Ontario in 2011. Both high winds and tornado damage caused trees to be uprooted, bent over and snapped off. A total of 9,083 ha of blowdown was recorded in Ontario in 2011, an increase of 7,761 ha compared to 2010 (Table 2.6). The largest area of damage was reported in Northwest Region with over 50% of the total blowdown in the province.

Table 2.6 Areas-within-which severe blowdown was recorded in Ontario, 2007-2011

Region	Area of Damage (ha)				
District	2007	2008	2009	2010	2011
Northeast					
Hearst	0	0	0	0	1,996
North Bay	0	0	0	0	14
Sault Ste. Marie	0	0	0	0	32
Sudbury	0	0	0	0	11
Timmins	0	0	0	0	60
Sub total	0	0	0	0	2,113
Northwest					
Dryden	7,166	0	898	0	1,078
Fort Francis	10,039	0	0	413	1,956
Kenora	13	0	339	0	0
Nipigon	0	0	10	47	89
Red Lake	0	6,167	3,553	284	1,124
Sioux Lookout	0	0	2,470	0	451
Thunder Bay	400	444	0	0	363
Sub total	17,618	6,611	7,270	744	5,061
Southern					
Aylmer	0	0	0	578	0
Bancroft	0	0	0	0	156
Guelph	0	0	0	0	1,751
Midhurst	0	0	348	0	1
Sub total	0	0	348	578	1,908
Provincial Total	**17,618**	**6,611**	**7,618**	**1,322**	**9,082**

For the past 13 years there has been some level of blowdown in Northwest Region. The greatest amount occurred in 2005 when there were over 500,000 ha of damage. In 2011 blowdown was reported in Thunder Bay, Nipigon, Dryden, Sioux Lookout, Red Lake and

Fort Frances districts totalling 5,061 ha, with the largest area of damage recorded in Fort Frances District (Figure 2.19).

During the first week of June 2011, a severe wind event occurred in the central portion of Fort Frances District in Northwest Region. This event resulted in 1,956 ha of severe damage to forest resources in this district. The main path of this storm began near Eagle Rock Lake and proceeded in a south easterly direction as far as Antoine Lake in Quetico Provincial Park. Damage included numerous small pockets of snapped stems and uprooted jack pine, black spruce and some trembling aspen that were laid out in a south-westerly direction. Two other paths of damage were detected in Fort Frances District. One consisted of scattered pockets of snapped off and uprooted trees east of Atikokan that started on the north end of Plateau Lake and extended into Thunder Bay District near Quetico Provincial Park. The second path was shorter and narrower. It paralleled the first path, and was characterized by twisted and snapped stems in a circular pattern.

Red Lake District, Northwest Region, had blowdown damage totalling 1,124 ha in the southeast portion of the district. On August 16th a wind storm travelled approximately 40 km northeast from Ear Falls to Fredart Lake, uprooting and breaking off trees along a path through stands of all ages affecting all boreal forest tree species.

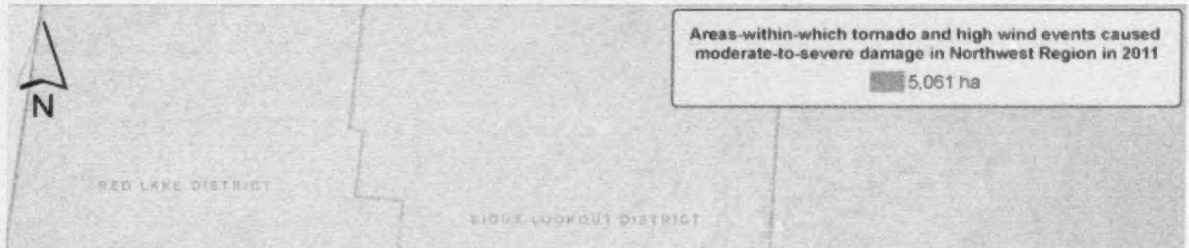

Areas-within-which tornado and high wind events caused moderate-to-severe damage in Northwest Region in 2011
▨ 5,061 ha
N
RED LAKE DISTRICT
SIOUX LOOKOUT DISTRICT
NIPIGON DISTRICT
KENORA DISTRICT
Kenora
Dryden
DRYDEN DISTRICT
THUNDER BAY DISTRICT
FORT FRANCES DISTRICT
Fort Frances
Thunder Bay
WAWA DISTRICT
0
62.5
125
250
Kilometers

Figure 2.19 Areas-within-which blowdown occurred in Northwest Region in 2011.

In 2011, two separate wind events in Dryden District caused a total of 1,078 ha of severe damage. The first event, the smaller of the two, occurred on July 21st starting from the northeast side of Dinorwic Lake travelling northeast through the Wabigoon First Nation community along Dinorwic Lake and stopping on the south side of Hwy. 17. The force of the winds caused trembling aspen and some conifers to uproot and snap-off.

The second major storm event occurred on the east side of the district on August 16th, producing a tornado that occurred just north of the town of Dryden paralleling North Road, travelling northeast through Taggart, Alder and Lynx lakes. This event extended into the west side of Sioux Lookout District where it ended on a large island in Lac Seul north of the town of Hudson. Two other pockets of blowdown were also recorded northeast of this area south of Bamaji and Roadhouse lakes. In total, blowdown in Sioux Lookout District was 451 ha. The storm event that caused this damage was classified as a F0 tornado on the Fujita scale by Environment Canada, with winds up to 116 km/hr. High winds caused trees to break and be uprooted as the tornado travelled into regenerating stands.

In 2011 Thunder Bay District also sustained blowdown damage during the month of June. Areas affected by these high winds were located southwest of Armstrong, near the south end of Wabakimi Provincial Park where a recent harvest of black spruce occurred. In total 363 ha of damage was aerially mapped in Thunder Bay District.

Several small, scattered pockets of uprooted and snapped off trees were observed in the central portion of Nipigon District in 2011, totalling 89 ha. This damage was located along Namewaminikan River and along the southern shores of Onaman, South Girvan and Knucklethumb Lakes.

In Northeast Region a total of 2,113 ha of blowdown was mapped in 2011. The majority of this damage was in the west central portion of Hearst District. Smaller areas were observed in Timmins, Sault Ste. Marie and Sudbury districts (Figure 2.20).

In Hearst District 1,996 ha of blowdown was aerially mapped on the west and east sides of Nagagami River in Auden and Fintry townships in 2011. The majority of the damage was in the northwest corner of Auden Township as whole stands of black spruce were levelled to the ground (Figure 2.21).

In the southern portion of Timmins District a small area of blowdown south of the village of Westree was aerially mapped by the Gogama OMNR area office (Figure 2.22). A total of four pockets of damage were recorded from Sandplain Lake to the north end of Shoofly Lake. All four pockets consisted of uprooted and snapped off mature trembling aspen, with a total of approximately 60 ha of damage.

In late July blowdown was reported by Clergue Forest Management in Sault Ste. Marie District totalling 32 ha. Significant damage to trembling aspen, eastern white pine, spruce and balsam fir; trees were reported to be snapped off and uprooted. The majority of damage was on trembling aspen in the north east area of Gapp Township at the north end of Whitman Dam Road. Two smaller pockets of blowdown were detected in east Nahwegezhic Township on the southern end of Cowie Lake and on the northeast side of Morrison Lake. A third pocket was also recorded in Lane Township on Hwy. 129 at the south end of Hinkler Creek.

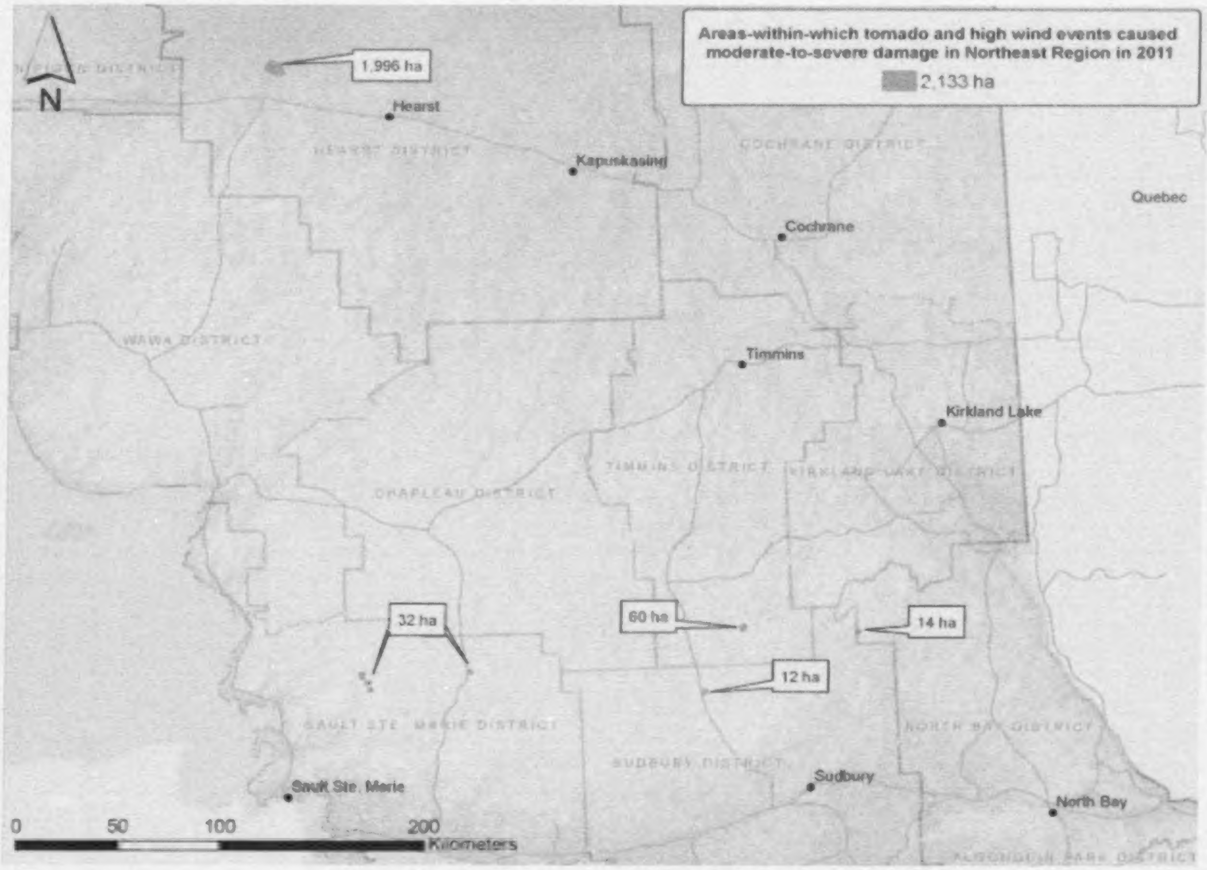

N
Areas-within-which tornado and high wind events caused moderate-to-severe damage in Northeast Region in 2011
▨ 2,133 ha
1,996 ha
Hearst
HEARST DISTRICT
Kapuskasing
COCHRANE DISTRICT
Quebec
Cochrane
WAWA DISTRICT
Timmins
Kirkland Lake
TIMMINS DISTRICT
KIRKLAND LAKE DISTRICT
CHAPLEAU DISTRICT
32 ha
60 ha
14 ha
12 ha
SAULT STE. MARIE DISTRICT
NORTH BAY DISTRICT
SUDBURY DISTRICT
Sudbury
Sault Ste. Marie
North Bay
ALGONQUIN PARK DISTRICT
0
50
100
200
Kilometers

Figure 2.20 Areas-within-which blowdown occurred in Northeast Region in 2011.

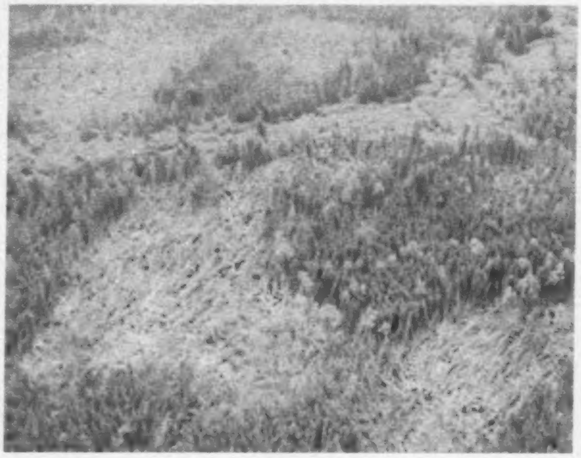


Figure 2.21 Blowdown in Hearst District (photo by A. Keizer).

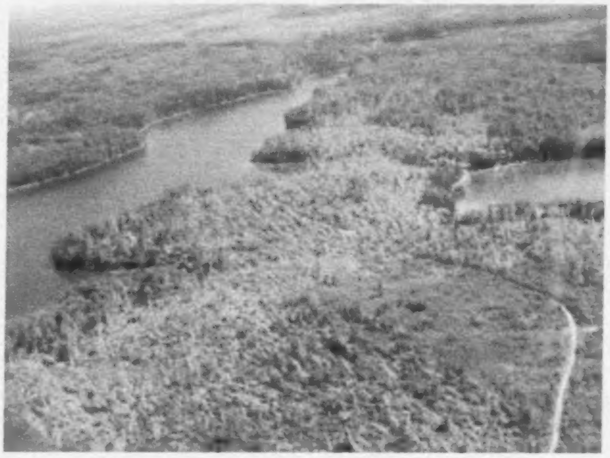


Figure 2.22 Blowdown south of Westree in Timmins District (photo by K. Aird).

Another storm event took place along the east shore of Lake Superior in the city of Sault Ste. Marie where several red pine trees were snapped off and uprooted near the Sault Ste. Marie airport.

In the northwest corner of North Bay District a small area of blowdown was recorded west of Pilgrim Lake, Dundee Township, consisting of 14 ha of severe blowdown.

In Sudbury District, one small patch of blowdown was reported at the northwest boundary of Halfway Lake Provincial Park. The damaged area totalled 12 ha and was characterized by uprooted trees in the central area of damage, while areas southwest and northeast of this were only partially damaged. The majority of damage was on black spruce with a small component of trembling aspen.

In Southern Region varying degrees of blowdown were observed from early spring to late summer in 2011. A total of 1,908 ha was observed in four districts with the majority of damage aerially mapped in Guelph District (Figure 2.23).

On August 21st a powerful tornado off Lake Huron on the northwest side of Guelph District went through the town of Goderich and travelled approximately 20 km eastward to the community of Benmiller. Environment Canada rated the tornado as an F3 on the Fujita scale, with wind peaks up to 320 km/hr causing severe damage to buildings and 1,751 ha of forested land (Figure 2.24). Uprooted, snapped off and bent over trees were observed in mixed hardwood stands as well as areas of eastern white cedar in the path of the tornado.

In the southeast corner of Guelph District a storm system swept through the Hamilton

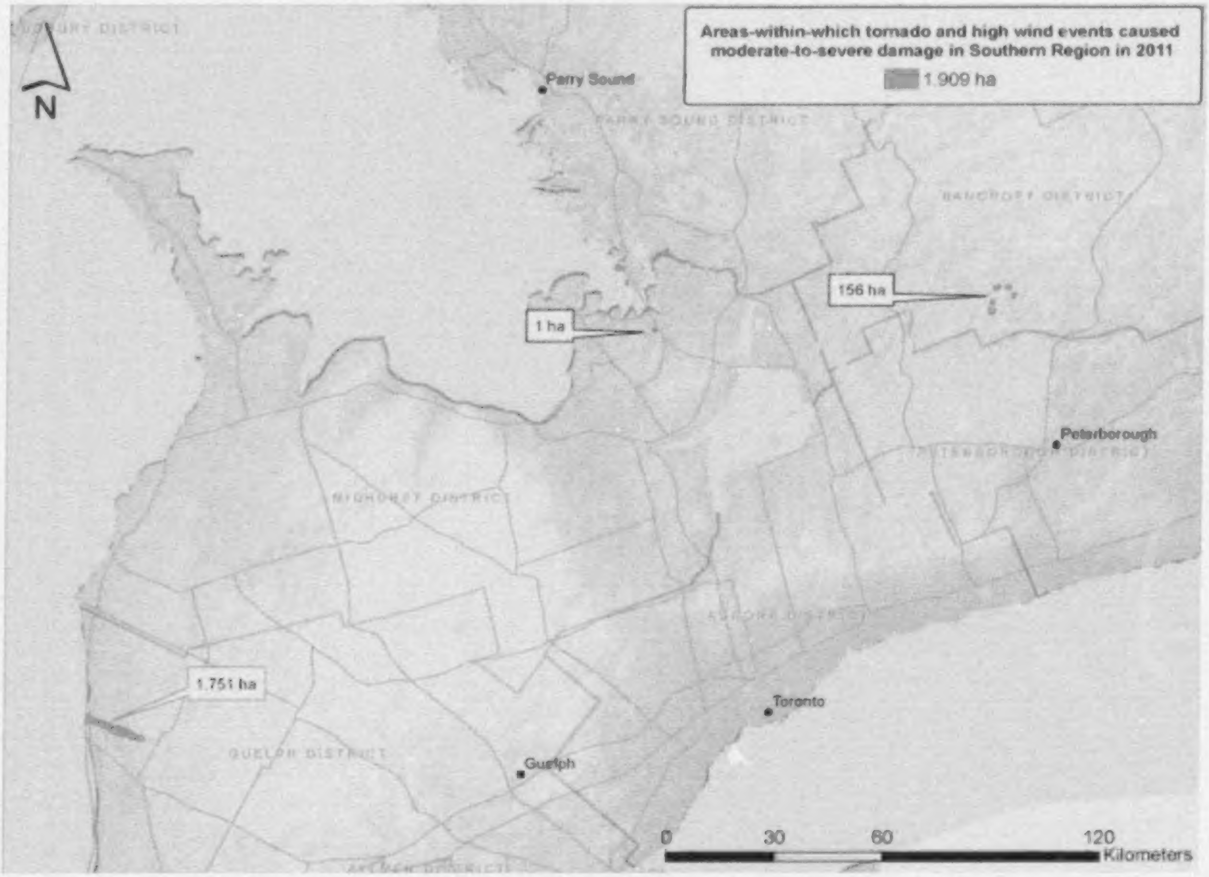

SUDBURY DISTRICT
N
Parry Sound
Areas-within-which tornado and high wind events caused moderate-to-severe damage in Southern Region in 2011
1.909 ha
PARRY SOUND DISTRICT
BANCROFT DISTRICT
156 ha
1 ha
Peterborough
PETERBOROUGH DISTRICT
MIDHURST DISTRICT
AURORA DISTRICT
1.751 ha
Toronto
GUELPH DISTRICT
Guelph
0
30
60
120
Kilometers
AYLMER DISTRICT

Figure 2.23 Areas-within-which blowdown occurred in Southern Region in 2011.

Figure 2.24 Blowdown near Goderich in Guelph District (photo by R. Lidster).

and Niagara regions in late April causing severe damage is far west as Caledonia. Gusts of winds up to 110 km/hr moved through this area damaging mature hardwood forests and snapping off branches and uprooting mature urban trees.

In the southwest portion of Bancroft District, 156 ha of blowdown were recorded by Bancroft District OMNR staff in five clustered locations in Galaway-Cavendish & Harvey Township, Peterborough County. The largest area of damage was recorded east and north of Bass Lake with two smaller areas recorded southeast and southwest of Loom Lake and 20 km west of Catahacoma Lake. The areas of blowdown were in mixed hardwood stands containing sugar maple, American beech and basswood.

In Midhurst District, a storm system caused damage to communities through the municipality of South Bruce during the first week of June. The system moved in from Lake Huron and caused damage to buildings, trees and hydro poles in a 45 km by 8 km swath. The storm flattened trees in MacGregor Point Provincial Park, near Port Elgin along hiking trails and through camp sites, damaging stands of mixed hardwoods dominated by ash and containing pockets of eastern white cedar.

In Algonquin District, strong winds caused blowdown in two small areas in the southern interior of the park located near Louisa Lake, Lawrence Township and the other at Pen Lake in the adjoining Nightingale Township.

Although blowdown is a common event in Ontario, and has been included as part of the annual forest health surveys, it has received increasing attention in recent years. This is likely a result of enhanced awareness resulting from climate change predictions of more frequent weather extremes and storm events. However, there is no clear trend of increased blowdown over the last 40 years (Figure 2.25).

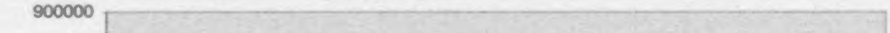


Figure 2.25 Areas-within-which blowdown caused severe damage in Ontario, 1975 – 2011.

Invasive Species in Ontario's Forests

S. McGowan[1], W. Byman[1], M. Francis[1], P. Hodge[1], R. Lidster[1], L. Rowlinson[1], C. Widdifield[1], S. Young[1], and A. Zeppa[1]

[1] *Ontario Ministry of Natural Resources, Science and Information Branch, Inventory, Monitoring and Assessment Section, Sault Ste. Marie*

SECTION 3

FOREST INSECTS

Pine false webworm, *Acantholyda erythrocephala* (L.)

Pine false webworm is native to Europe and Asia and was first collected in Ontario in 1961. Prior to the early 90's, this pest rarely affected mature host trees and was considered a chronic problem of young pines. In 1993 this changed as large scale infestations began to occur on semi-mature and mature pine stands. Since 1993, there has been landscape level defoliation recorded in the province. Damage by this pest peaked in the province during 1997 when 8,922 hectares (ha) of moderate-to-severe defoliation was recorded. Since that time, defoliation has significantly declined (Table 3.1).

In 2011, a total of 55 ha of moderate-to-severe pine false webworm defoliation was aerially mapped in Ontario, all of which occurred in Northeast Region. Infestations in Southern Region all but diminished in 2011, as small infestations causing light to moderate levels of defoliation were recorded.

In Northeast Region 55 ha of moderate-to-severe defoliation were aerially mapped in North Bay District for the third consecutive year.

Moderate-to-severe defoliation was recorded on red pine and eastern white pine on four islands in the west arm of Lake Nipissing. Defoliation was also mapped along the shore of two separate peninsulas in the western portion of the lake, south of Lavigne and east of Jennings Point.

Table 3.1 Area of moderate-to-severe defoliation caused by pine false webworm in Ontario from 2003-2011

Region	**Area of Defoliation (ha)**				
District	**2003-2007**	**2008**	**2009**	**2010**	**2011**
Northeast					
Hearst	0	0	0	0	0
North Bay	0	0	12	10	55
Sault Ste. Marie	0	0	179	26	0
Sudbury	0	0	0	0	0
Timmins	0	0	0	0	0
Sub total	0	0	191	36	55
Southern					
Bancroft	16	0	0	0	0
Midhurst	3,191	26	11	0	0
Peterborough	197	0	0	0	0
Sub total	3,404	26	11	0	0
Provincial Total	**3,404**	**26**	**202**	**36**	**55**

Another small area of eastern white pine was aerially mapped further inland, east of the city of North Bay in Olrig and Phelps townships. The majority of this defoliation was located in the southwest of Olrig Township and into the southeast of Phelps Township.

Light defoliation was noted during ground surveys of eastern white pine in the Gurd Research and Demonstration Area west of Trout Creek.

Pine false webworm populations continued to cause moderate-to-severe levels of defoliation in Sault Ste. Marie District in 2011, but populations collapsed in the Garden River area where pine false webworm had been defoliating eastern white pine for the past five years. Infestation levels were also very low in Kirkwood Forest on mature eastern white pine.

Severe defoliation occurred at the Ministry of Natural Resources Arboretum on Third Line in Sault Ste. Marie in 2011. Defoliation was severe in three plantations, two of which were young open-growing eastern white pine less than 3 m in height. The third plantation was a mix of eastern white pine and hybrids of Himalayan blue pine, Korean white pine, Japanese white pine and Macedonian pine with eastern white pine. In the eastern white pine plantations less than 20% of the trees were affected, but defoliation averaged 60%. The majority of trees defoliated were located on the edge of the plantation. In the hybrid plantation, the Macedonian x eastern white pine hybrids had the most defoliation, ranging from 20% to 70% on edge trees (Figure 3.1).

Additional populations were found on St. Joseph Island where a single eastern white pine was severely defoliated along Hwy. 548, northeast of Hilton Beach, Hilton Township and on a semi-mature Scots pine in Jocelyn Township where light levels of defoliation were recorded.

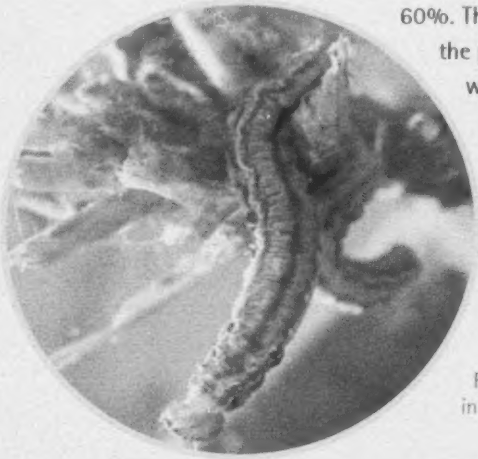


Figure 3.1 Pine false webworm larvae feeding on Macedonian pine in Sault Ste. Marie District (photo by M. Francis).

In Southern Region pine false webworm populations were identified in Midhurst District with moderate levels of defoliation observed near Walkerton, Bruce County in a young white pine plantation. Trace levels of defoliation were also observed in Chatsworth Township in a semi-mature eastern white pine plantation where populations have persisted over the past several years. In addition to this, trace numbers of larvae were observed on eastern white pine at the Epping Lookout in Grey Highlands, Grey County where this insect has maintained a residual population in Midhurst District.

Emerald ash borer, *Agrilus planipennis* Fairmaire

Emerald ash borer (EAB) is an exotic buprestid beetle from Asia (Figure 3.2) that is thought to have invaded Ontario after first establishing in the Detroit area of Michigan.

This invasive insect attacks all species of ash. The adult beetle conducts maturation feeding on foliage, before the adults mate and lay eggs. While this results in some loss of leaf surface area, it is the larvae which kill the tree by feeding on the cambium and nearby tissues under the bark. The serpentine tunnels created by the larvae eventually kill the tree through the disruption of its vascular system (Figure 3.3).

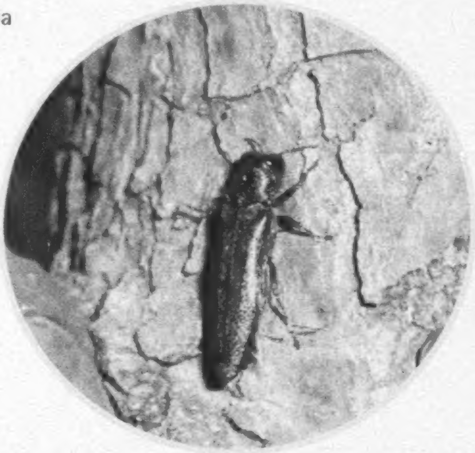


Figure 3.2 Adult emerald ash borer resting on an ash tree in Aylmer District (photo by L. Tucker).

EAB was discovered in Ontario in the city of Windsor in 2002 by Ontario Ministry of Natural Resources (OMNR) and Canadian Forest Service (CFS) forest health staff. By the end of 2007, populations were detected by the Canadian Food Inspection Agency (CFIA) throughout Essex County and the Municipality of Chatham-Kent; St. Clair Township, Lambton County; city of London, Middlesex County; and north of Turkey Point, Norfolk County, with MNR detecting EAB in the Municipality of Dutton-Dunwich, Elgin County and in the city of Toronto, Southern Region.

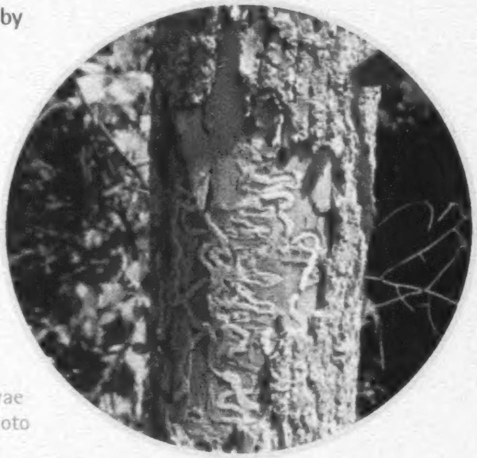


Figure 3.3 Feeding galleries caused by emerald ash borer larvae located just under the bark of an ash tree in Aylmer District (photo by P. Hodge).

By the end of 2010, further discoveries of EAB populations were detected by OMNR, CFIA and municipal staff in several locations across Ontario. New urban infestations were found in Ottawa, Oakville, Pickering, Mississauga, Brampton, Vaughan, Hamilton, Brantford, and Oshawa, Southern Region and in Sault Ste. Marie, Northeast Region. Detections of EAB were also made in rural areas near the community of Bayfield in the municipality of Bluewater; near Mallorytown, Leeds and Grenville County; Perth County; Oxford County and within the Regional Municipality of Waterloo, Southern Region.

In 2011, CFIA detected EAB in two new locations in Ontario. In both instances a single adult beetle was caught in a green prism trap baited with green-leaf volatiles. One site was at a private campground along Hwy. 6, near Sheguindah, Manitoulin Island, Sault Ste Marie District. The second was at a rest stop and service station near Wendover, United Counties of Prescott and Russell, Kemptville District. OMNR and CFIA staff conducted follow-up surveys using branch sampling, tree cutting and bark stripping, and visual surveys at the Sheguindah site. No evidence was found of infested trees. Similarly, OMNR conducted branch sampling and CFIA conducted visual inspections and bark window sampling at the Wendover site and found no evidence of infested trees.

The long distance spread of EAB beyond the original infestation of southwestern Ontario and southeastern Michigan is likely a result of people moving infested ash materials, particularly firewood.

The emerald ash borer, ash material, nursery trees, and firewood movement are all regulated by CFIA. Areas regulated by CFIA now include the cities of Hamilton, Sault Ste. Marie, the Greater Toronto Area and Ottawa; the Regional Municipalities of Chatham-Kent, Durham, York, Peel, Halton, Niagara and Waterloo; the Counties of Brant, Elgin, Essex, Haldimand, Huron, Lambton, Middlesex, Norfolk, Oxford, Perth and Wellington; and the United Counties of Leeds and Grenville (Figure 3.4).

A notice of prohibition of movement of EAB, ash material, and firewood has been issued by CFIA to the individual property owner at Sheguindah on Manitoulin Island, and to the rest stop and service station in United Counties of Prescott and Russell to prevent the movement of potentially infested materials (For more information regarding emerald ash borer visit http://www.inspection.gc.ca).

In 2011 OMNR staff conducted an EAB detection survey at 30 locations across Northwest and Northeast regions using green prism traps baited with Z3-hexanol green leaf volatile lure. Areas surveyed included Fort Frances, Kenora, Dryden, Nipigon, Cochrane, Kapuskasing, Timmins and Hearst districts using 1 trap per site, all with negative trap results. This was followed up with branch sampling, an early detection method developed by Canadian Forest Service. Branch sampling involved cutting two branches approximately 5-8 cm diameter at the base from the mid crown of a sample tree. The bark was then stripped in thin layers from the basal 50 cm of the branch to look for larval EAB tunnels. No emerald ash borer adults were caught in the OMNR prism traps, and no larval tunnels were found by the branch sampling in either Northwest or Northeast regions.

OMNR forest health staff assisted the city of Thunder Bay by providing training and branch sampling demonstrations. In addition, a branch sampling project was carried out by OMNR forest health staff in eight locations from the United Counties of Prescott and Russell (Kemptville District) to Deep River (Pembroke District) concentrating efforts at service stations, rest stops and lodging accommodations. All of these branch sampling surveys found no evidence of EAB infestations at these sites.

Aerial surveys were performed in 2011 to monitor forest level impacts of EAB in Aylmer and Guelph districts and in the separate infestation in Kemptville District. In total 25,129 ha of additional severe decline and mortality was identified in Ontario in 2011. This brought the ash cumulative decline and mortality due to EAB from 2004-2011 to 63,421 ha (Table 3.2 and Figure 3.5).

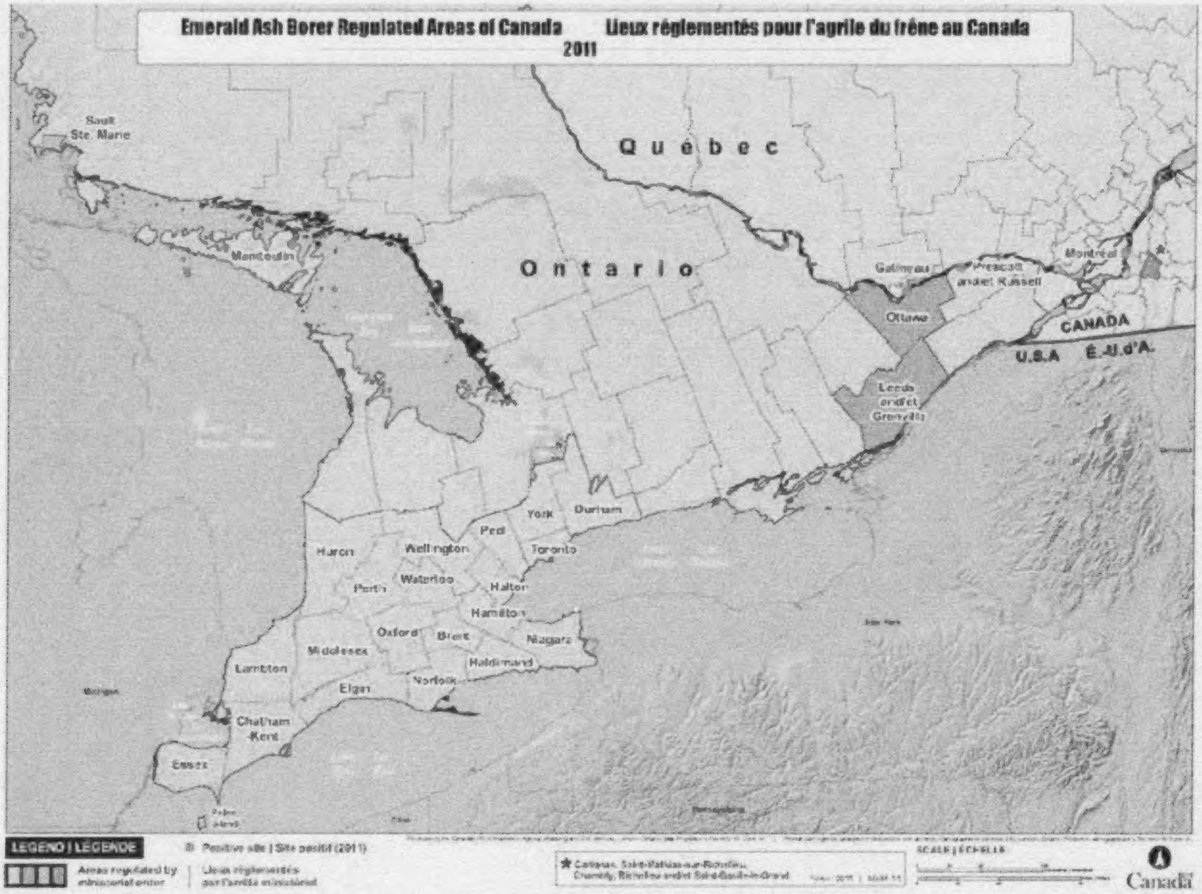

Emerald Ash Borer Regulated Areas of Canada
Lieux réglementés pour l'agrile du frêne au Canada
2011
Québec
Ontario
Sault Ste. Marie
Manitoulin
Gatineau
Prescott and/et Russell
Montréal
Ottawa
CANADA
U.S.A
É.-U. d'A.
Leeds and/et Grenville
York
Durham
Peel
Huron
Wellington
Toronto
Waterloo
Perth
Halton
Hamilton
Oxford
Brant
Niagara
Middlesex
Haldimand
Lambton
Norfolk
Elgin
Chatham-Kent
Essex
LEGEND | LÉGENDE
Positive site | Site positif (2011)
Areas regulated by ministerial order | Lieux réglementés par l'arrêté ministériel
SCALE | ÉCHELLE
Canada

Figure 3.4 Areas regulated for the emerald ash borer by the Canadian Food Inspection Agency in Ontario in 2011.

Table 3.2 Cumulative area of severe decline and mortality in ash species caused by emerald ash borer in Ontario 2004-2011

Region	Area of Decline (ha)				
District	2004-2007	2009*	2010	2011	TOTAL
Southern					
Aylmer	7,122	11,734	19,436	24,324	62,616
Guelph	0	0	0	177	177
Kemptville	0	0	0	628	628
Provincial Total	7,122	11,734	19,436	25,129	63,421

**No survey was conducted in 2008. Therefore area calculations for 2009 include damage that occurred in 2008.*

Decline and mortality by EAB expanded in 2011 to almost all of west Aylmer District and into Guelph District along the shore of Lake Huron (Figure 3.6). The easterly front moved to central Middlesex and Elgin counties, spanning from North Middlesex south to Komoka, Middlesex County to St. Thomas to Port Stanley, Elgin County. Large satellite pockets were found in the surrounding London area, (Middlesex County, Aylmer District) and north of Grand Bend and in the Municipality of Bluewater (Huron County, Guelph District).

In Kemptville District aerial surveys revealed a total of 754 ha of EAB-associated decline and mortality in 2011 (Figure 3.7).

In Ottawa, where EAB was discovered in 2008, populations have since developed and extended outward in all directions. Large wooded areas affected by EAB were located in the Cyrville and Hawthorn Meadows locales of Ottawa with many satellite pockets occurring east to Orleans and west to Nepean following Hwy. 416 south to Barrhaven.

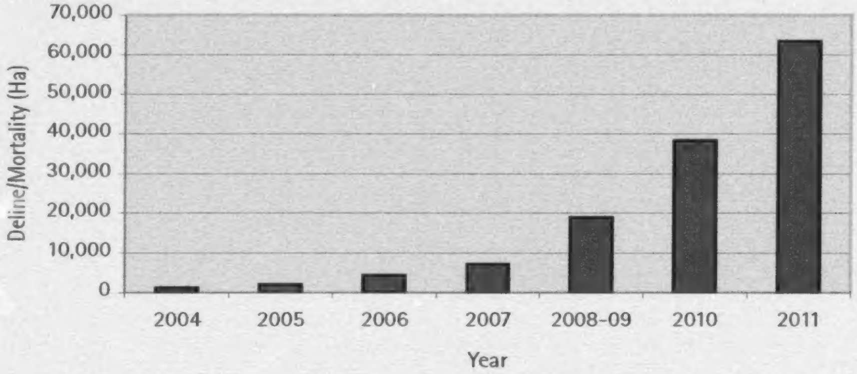
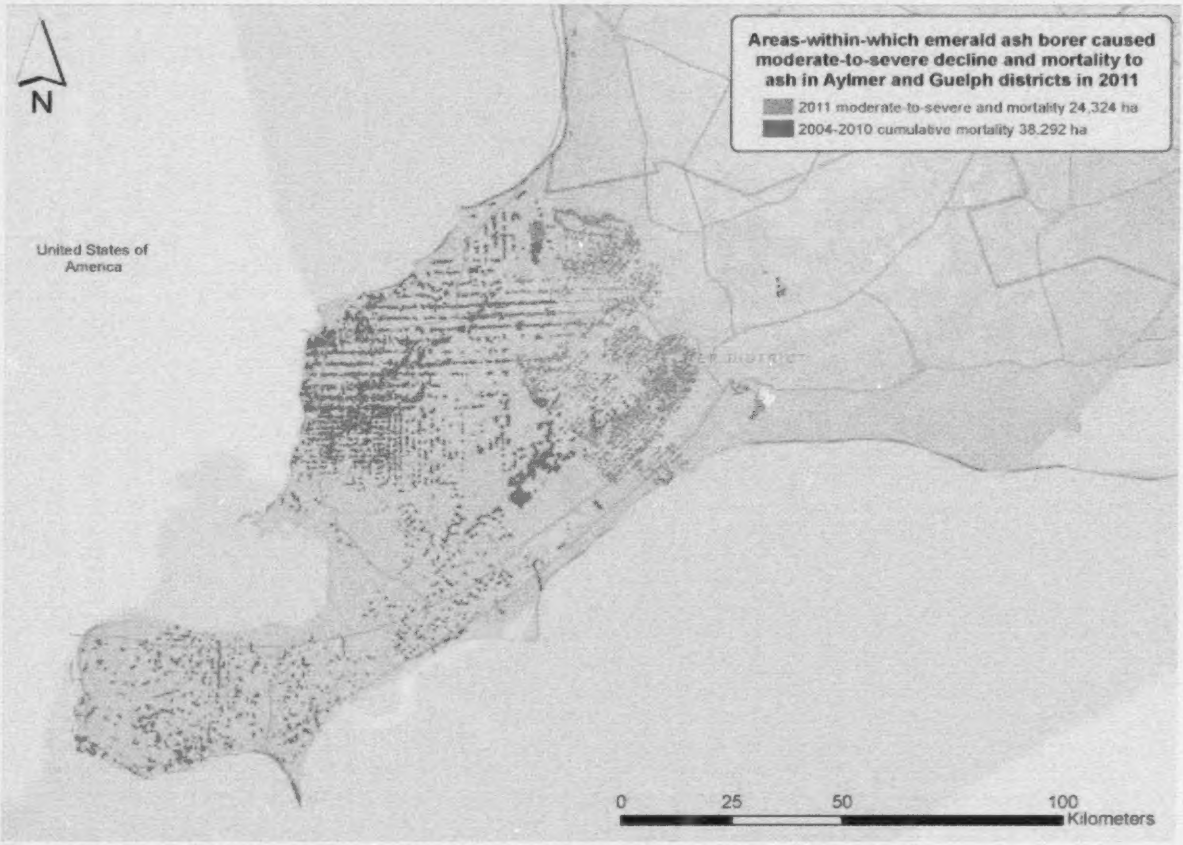


Figure 3.5 Cumulative total area-within-which emerald ash borer caused moderate-to-severe decline and mortality 2004-2011.



Areas-within-which emerald ash borer caused moderate-to-severe decline and mortality to ash in Aylmer and Guelph districts in 2011

▒ 2011 moderate-to-severe and mortality 24,324 ha
■ 2004-2010 cumulative mortality 38,292 ha

Figure 3.6 Areas-within-which emerald ash borer caused severe decline or mortality to ash in Aylmer and Guelph districts in 2011.

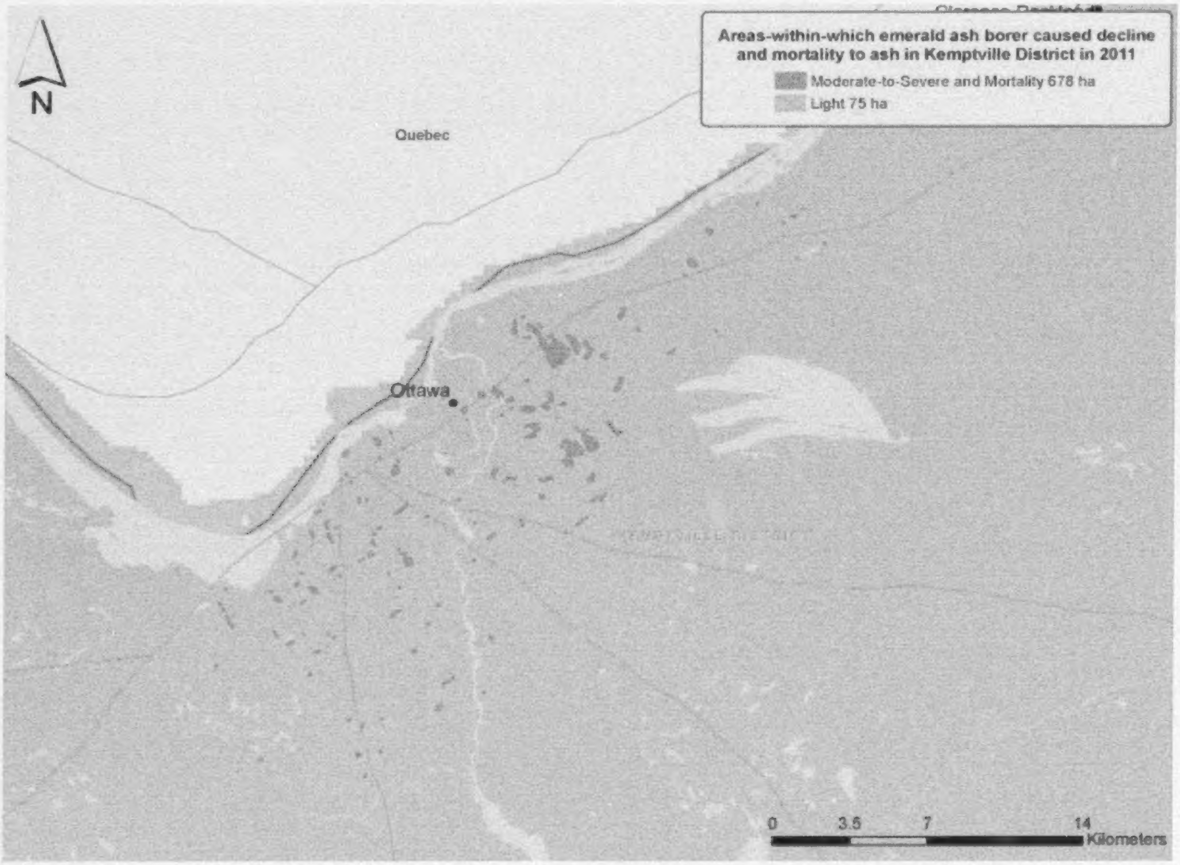

N
Quebec
Areas-within-which emerald ash borer caused decline and mortality to ash in Kemptville District in 2011
▨ Moderate-to-Severe and Mortality 678 ha
▨ Light 75 ha
Ottawa
KEMPTVILLE DISTRICT
0
3.5
7
14
Kilometers

Figure 3.7 Areas-within-which emerald ash borer caused decline or mortality to ash in Kemptville District in 2011.

Larch casebearer, *Coleophora laricella* (Hbn.)

This European pest was introduced to North America in the late 1800's. It is now found across the range of tamarack and throughout European larch plantations in Ontario (Figure 3.8).

In 2011, a total of 1,591 ha of moderate-to-severe defoliation was aerially mapped in Ontario, all of which occurred in Southern Region (Figure 3.9). Defoliation was recorded in Peterborough, Midhurst, Pembroke, Kemptville and Bancroft Districts, Southern Region. Larch casebearer was also detected from ground surveys in Sudbury District, Northeast Region, but the area defoliated was not large enough to aerially map.

Figure 3.8 Larch case bearer larva feeding from within the protective casement constructed from previously mined foliage (photo by P. Hodge).

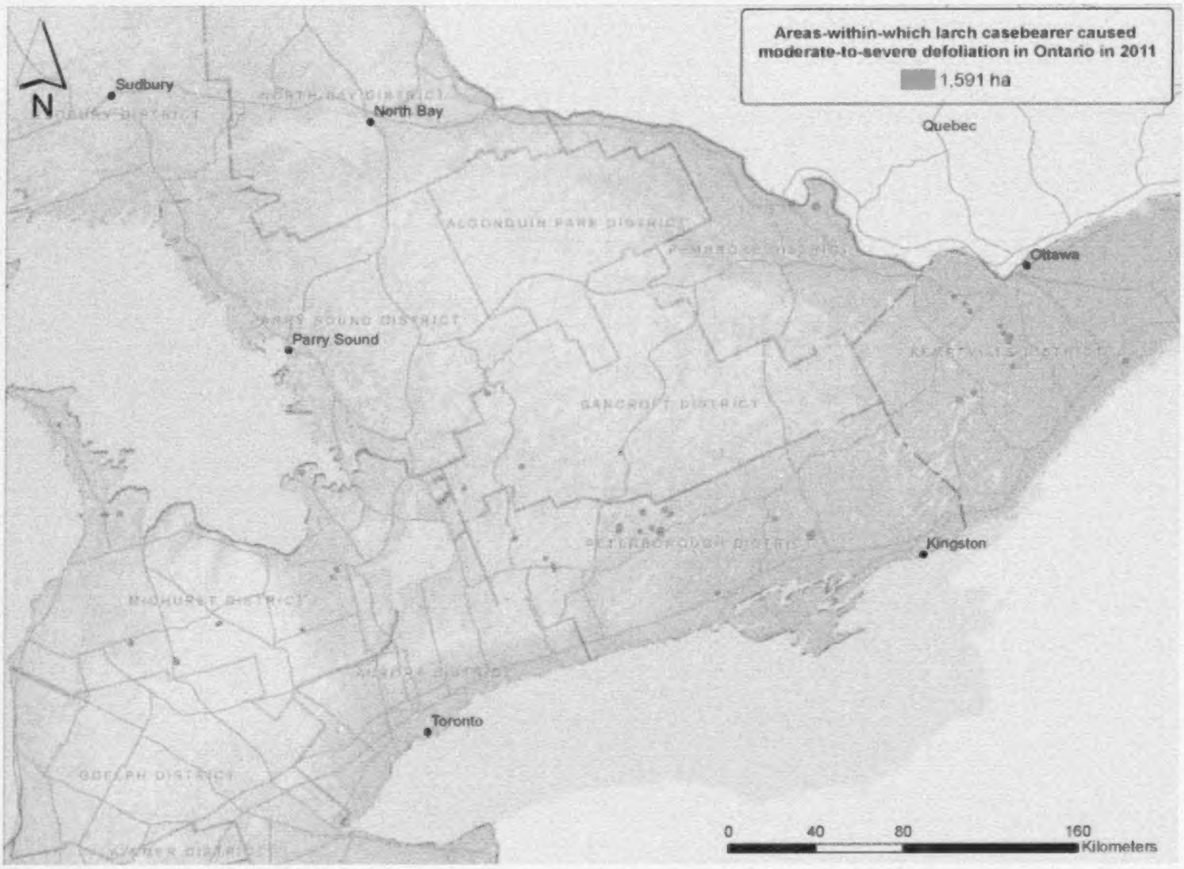

Areas-within-which larch casebearer caused moderate-to-severe defoliation in Ontario in 2011
1,591 ha
N
Sudbury
North Bay
NORTH BAY DISTRICT
SUDBURY DISTRICT
Quebec
ALGONQUIN PARK DISTRICT
PEMBROKE DISTRICT
Ottawa
PARRY SOUND DISTRICT
Parry Sound
KEMPTVILLE DISTRICT
BANCROFT DISTRICT
PETERBOROUGH DISTRICT
Kingston
MIDHURST DISTRICT
AURORA DISTRICT
Toronto
GUELPH DISTRICT
AYLMER DISTRICT
0
40
80
160
Kilometers

Figure 3.9 Areas-within-which larch casebearer caused moderate-to-severe defoliation in Ontario in 2011.

In Peterborough District, larch casebearer caused 562 ha of moderate-to-severe defoliation to naturally occurring tamarack in 2011. Large areas of severe defoliation were concentrated along the southern shore of Stoney Lake, Peterborough County and in Menzel Centennial Provincial Nature Reserve, Lennox and Addington County affecting 198 ha and 164 ha respectively.

Other satellite pockets affecting smaller areas of tamarack were located mainly in Havelock-Belmont-Methuen Township, Peterborough County; in the Lake of Bays area, Halliburton County; and along Hwy. 7 between the towns of Norwood and Havelock (Figure 3.10). Tamarack was also severely affected along Hwy. 62 from County Road 620 south to Gilmour, Hastings County.

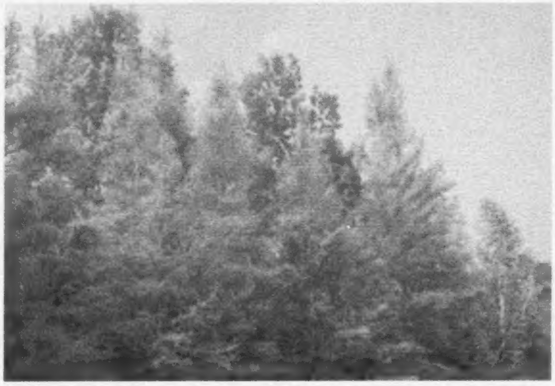


Figure 3.10 Moderate-to-severe defoliation caused by larch case bearer to tamarack in Peterborough District (photo by P. Hodge)

In Midhurst District a total of 525 ha of moderate-to-severe defoliation was aerially mapped in 2011. Two of the larger defoliated areas occurred south of Wiarton, Bruce County and east of Orillia, Simcoe County. Approximately 30 ha of moderate-to-severe defoliation were also recorded in Minesing Wetland Conservation Area, Nottawasaga Valley Conservation Authority. Infestations have occurred here over the past 10 consecutive years with the exception of 2006. In addition to this, many satellite pockets of moderate-to-severe defoliation occurred throughout south central Grey County.

In Pembroke District 232 ha of moderate-to-severe defoliation were mapped in White Water Township, east of Pembroke affecting semi-mature tamarack. Throughout central Kemptville District, another 227 ha of moderate-to-severe defoliation were mapped in scattered satellite pockets affecting 60% of tamarack in the area.

In Parry Sound District a collapse in larch casebearer populations occurred in 2011. Infestations were found only at trace levels in numerous locations across the district as compared to nearly 1,289 ha of moderate-to-severe defoliation recorded in 2010.

Birch casebearer, *Coleophora serratella* (L.)

Moderate-to-severe defoliation caused by the non-native birch casebearer was recorded in Southern and Northeast regions in Ontario in 2011. This defoliation was detected on white birch at one location in Sudbury District with the remainder of defoliation affecting white birch at trace levels in Pembroke and Bancroft districts.

The native lesser birch casebearer (*Coleophora comptoniella* (McD.)) was also detected feeding alongside birch casebearer in Southern Region with light defoliation occurring throughout Charleston Lake Provincial Park, Pembroke District.

These two pests also caused trace levels of defoliation on white birch along Rahn's Road, Renfrew County, Pembroke District and along Gold Lake Rd, Kawartha Highlands Signature Site Park, Bancroft District (Figure 3.11).

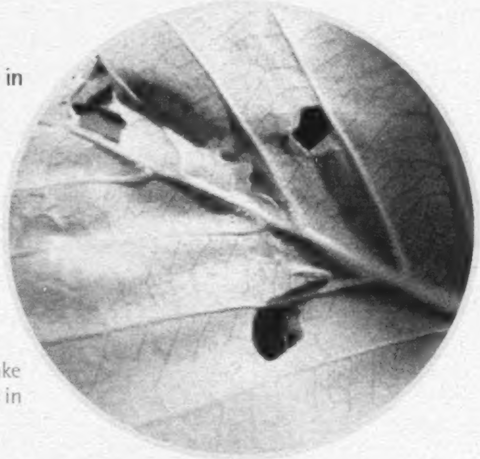


Figure 3.11 Birch casebearer on white birch in Charleston Lake Provincial Park, Leeds and Grenville County, Kemptville District in 2011 (photo by A. Zeppa).

In Northeast Region moderate-to-severe defoliation occurred on white birch along Crystal Lake Rd, north of Sturgeon Falls and at trace levels in scattered infestations throughout the city of North Bay, North Bay District.

Beech scale, *Cryptococcus fagisuga* Linding.

Beech scale was first introduced to North America at Halifax, Nova Scotia prior to 1890. The insect predisposes American beech to infection by beech bark disease (*Neonectria faginata* (M.L. Lohman, A.M.J. Watson & Ayers) Castl. & Rossman). Following the introduction of beech scale, this insect has slowly spread westward into Quebec and

Ontario including many Great Lake States. Heavy infestations of the scale are typically followed a few years later by infection by beech bark disease. The disease then causes a substantial decline in the health of American beech trees (see section on beech bark disease).

Beech scale can now be found scattered throughout the natural range of American beech in Ontario and was reported in several locations in Southern and Northeast regions in 2011.

As in previous years, beech scale was observed in Aylmer, Guelph, and Midhurst districts, Southern Region. For the first time, this insect was confirmed in Huron County, Guelph District where surveys detected a light infestation at two locations: northwest of Goderich, and in a woodlot near Wingham. Established beech scale populations were also found in St. Johns Conservation Area, Niagara Peninsula Conservation Authority and Short Hills Provincial Park, Guelph District.

In Aylmer District, low populations of beech scale were detected in Springwater Forest, Elgin County and in the Courtland area, Norfolk County.

In Midhurst District severe levels of scale (Figure 3.12) were detected throughout Grey County advancing west into Bruce County in 2011. Moderate levels of scale infestations occurred in the western portion of the district, declining to light levels just east of Port Elgin and north to Howdenvale, Bruce Peninsula.

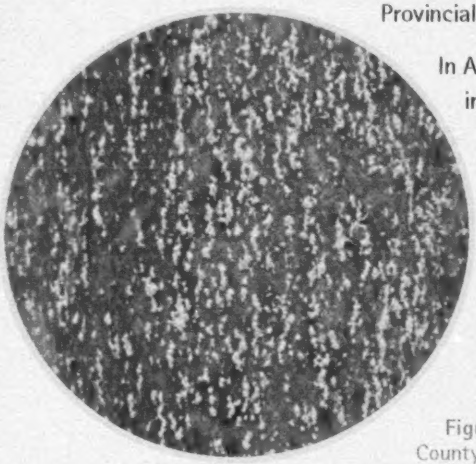


Figure 3.12 High levels of beech scale on American beech in Bruce County, Midhurst District (photo by P. Hodge).

Moderate levels of scale were also recorded in Wasauksing First Nation, Parry island and in McClintock Township, Parry Sound District.

In Northeast Region, Sault Ste. Marie District, an individual American beech tree was located at the Sault Locks with moderate levels of beech scale in Sault Ste Marie. In addition, a survey carried out on St Joseph Island in 2011 revealed high levels of scale in the south end of the island and light-to-moderate levels of scale in the Hilton Beach area.

Introduced pine sawfly, *Diprion similis* (Htg.)

This insect causes defoliation to many pine species with a preference for eastern white pine and Scots pine in Ontario.

Introduced pine sawfly populations were relatively low across the province in 2011, although colonies were detected in Northwest, Northeast and Southern regions. Several small populations were scattered across the province causing trace-to-moderate levels of defoliation.

In Northwest Region, larvae were found feeding on eastern white pine in Fort Frances at Windy Point and near the intersection of Tar Barrel Trail and Hopkins Bay Road at light-to-moderate levels; on jack pine along Gundy Road in Kenora District at trace levels; and on ornamental Scots pine in Thunder Bay at light-to-moderate levels.

In Northeast Region, trace defoliation was observed at a residential location within the city of North Bay on eastern white pine.

In Southern Region, low populations produced trace defoliation on eastern white pine in the Millenium Tract of Simcoe County Forest, Midhurst District, where populations have existed for many years. Low numbers of larvae were observed on red pine near the intersection of Hwy. 401 and Hwy. 6, Guelph District.

Satin moth, *Leucoma salicis* (L.)

Satin moth is an introduced forest pest that feeds on all species of poplar and willow in Ontario but is often found feeding on European white poplar and trembling aspen (Figure 3.13).

This insect has been confirmed in Northeast and Southern Region in the past and was again identified in Midhurst and Aurora districts, Southern Region and in Sudbury District, Northeast Region in 2011.

In Midhurst District, Southern Region, larvae were prevalent in scattered areas within Bruce County ranging as far north as Ferndale, North Bruce Peninsula where several roadside trees were completely stripped of foliage east of Sauble Beach. Defoliation also occurred in the Durham and Markdale areas, Grey County causing moderate levels of defoliation.

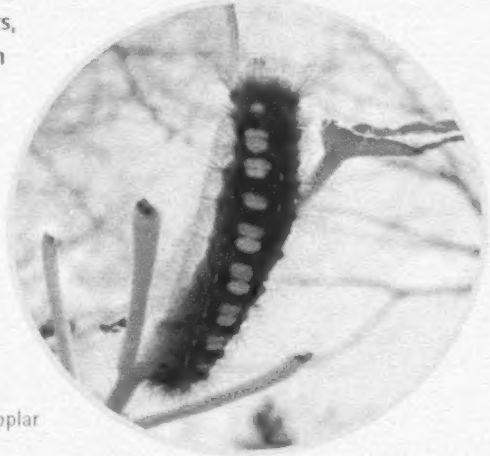


Figure 3.13 Satin moth larvae feeding on European white poplar (photo by C. Widdifield).

In Aurora District, European white poplar was affected as far east as Holland Landing in York Regional Municipality, where severe levels of defoliation were detected.

In Sudbury District a single open grown European white poplar located at Ellen's Place Restaurant and Motel in Walford along Hwy. 17 was completely defoliated by satin moth.

Gypsy moth, *Lymantria dispar* (L.)

This European defoliator feeds on a wide variety of trees. Although it prefers oak it feeds on many hardwood species that occur in Ontario as well as on some conifers including eastern white pine. It has also been found defoliating Colorado blue spruce in urban areas.

The first detection of gypsy moth in Ontario occurred in 1969 however widespread defoliation did not occur until 1981. The insect is now widespread across much of the range of oak in Ontario. It is commonly found south of the Hwy. 17 corridor from Sault Ste.

Marie east to Sudbury, North Bay, and Mattawa. An isolated infestation has persisted for several years on bur oak within the town of New Liskeard. No infestations have been found elsewhere in this part of Northeast Region where bur oak grows to the northern extent of its range. Similarly, no infestations have been found in Northwest Region where bur oak grows in a band along the southern portion of the region from Thunder Bay west along the U.S. border.

Since 1981, gypsy moth has caused periodic moderate-to-severe defoliation in Ontario, with major outbreaks peaking in 1985, 1991 and 2002 (Figure 3.14). The most recent outbreak was much less severe than previous ones, peaking in 2008 at 39,476 ha of moderate-to-severe defoliation (Table 3.3). In 2009 and 2010, unfavourable conditions for the insect consisting of moist, cool spring and early summer weather allowed for rapid proliferation of the fungus *Entomophaga maimaiga* (Humber, Shimazu & R.S. Soper). The fungus caused a collapse of the gypsy moth population such that no defoliation could be aerially mapped in 2010 or 2011. This marks the first and second years since 1981 that no gypsy moth defoliation was aerially mapped in Ontario.

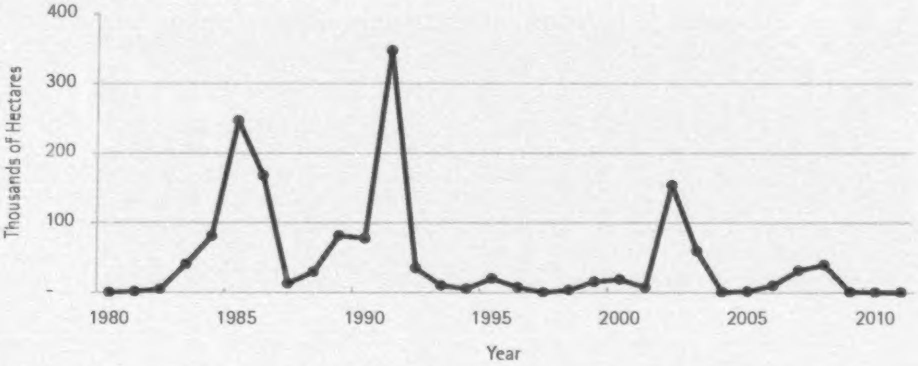


Figure 3.14 Gypsy moth moderate-to-severe defoliation in Ontario, 1981-2011.

Table 3.3 Cumulative area of moderate-to-severe defoliation caused by gypsy moth in Ontario 2007-2011

Region	Area of Defoliation (ha)				
District	2007	2008	2009	2010	2011
Northeast					
Sault Ste. Marie	0	1,212	0	0	0
Sudbury	0	15,507	0	0	0
Sub total	0	16,719	0	0	0
Southern					
Aurora	1,474	2,292	0	0	0
Aylmer	4,064	6,854	84	0	0
Guelph	25,556	11,136	97	0	0
Midhurst	0	2,459	204	0	0
Peterborough	0	16	0	0	0
Sub total	31,094	22,757	385	0	0
Provincial Total	31,094	39,476	385	0	0

In 2011, remnant populations caused no significant defoliation to Ontario's forest cover however gypsy moth was reported in Northeast and Southern Regions.

In Northeast region, gypsy moth was recorded in Espanola, Sudbury District as a secondary pest in conjunction with paleheaded aspen leafroller (*Anacampsis niveopulvella* (Chamb.)), birch-aspen leafroller (*Epinotia solandriana* L.) and speckled green fruitworm (*Orthosia hibisci* (Gn.)) causing 90% defoliation to 80% of the trembling aspen in the area. Elsewhere in the region, the isolated gypsy moth population in New Liskeard has disappeared. No larvae, eggs, pupae or adults were found here in 2011.

In Southern Region gypsy moth was recorded in Pembroke, Midhurst and Aylmer districts. In Pembroke District gypsy moth larvae were collected in conjunction with hickory leaf roller (*Pseudexentera cressoniana* (Clem.)) as primary pests causing moderate defoliation. Feeding alongside these pests causing minor defoliation was speckled green fruitworm (*Orthosia hibisci* (Gn.)) and three-lined leaf roller (*Pandemis limitata* (Rob.)) visible from the ground on red oak on Station Hill Road, Pembroke District.

In Midhurst District gypsy moth larvae were identified feeding along with forest tent caterpillar causing trace levels of defoliation to red oak, near the town of Kemble. In Aylmer District solitary larvae were identified feeding on a single red oak near Sylvan and within South Walsingham Tract, Norfolk County.

European pine sawfly, *Neodiprion sertifer* (Geoff.)

European pine sawfly was first found in North America in 1925 in the state of New Jersey. Fourteen years later it was collected in Ontario in the city of Windsor. This introduced pest of pines prefers to feed on Scots pine but can also be found on red, jack, and mugho pine in Ontario (Figure 3.15).

In 2011 small areas in Northeast and Southern regions had localized populations of European pine sawfly, but very little significant defoliation.

In 2009 this pine defoliator was found in Northeast Region in Sault Ste. Marie District on immature and mature Scots pine in the Kentvale area on St. Joseph Island. Although no defoliation was found here in 2010, in 2011 European pine sawfly reappeared on the island where it was recorded near Kentvale and towards the southeast of the island.

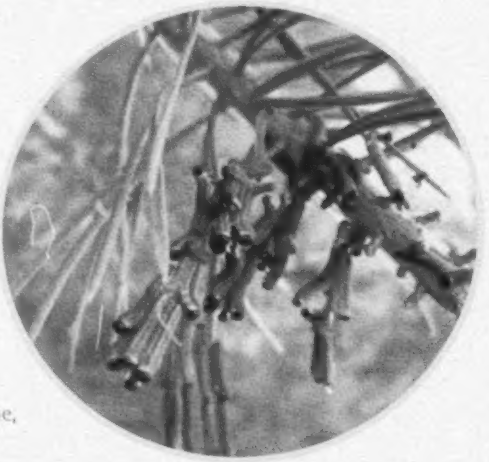


Figure 3.15 European pine sawfly larvae feeding on Scots pine, Peterborough District (photo by P. Hodge).

Previous year's needles are generally consumed but damage was hard to quantify as several other agents were affecting tree health. Pine false webworm, pine tortoise scale (*Toumeyelaa parvicornis* (Ckll.)) and brown spot needle blight (*Mycosphaerella dearnessii*

M.E. Barr (Anamorph: *Lecanosticta acicola* (Thümen) H. Sydow)) were causing moderate-to-severe damage with the blight responsible for premature needle drop.

In Southern Region European pine sawfly was observed in two districts in 2011. In both cases larvae were found on Scots pine causing light-to-moderate defoliation.

In Midhurst District, this insect was detected in the west end of the district where larvae were found feeding on Scots pine in Inverhuron Provincial Park, west of Tiverton. Further inland, sawfly larvae were found in Bruce County on young Scots pine north of Walkerton. In Simcoe County, this invasive pest was feeding on young roadside Scots pine near Lafontaine. Larvae were also detected near Midhurst in a young red pine plantation mixed with young Scots pine saplings, resulting in moderate defoliation of several trees in all locations.

In Peterborough District European pine sawfly was detected in a 16 year old Scots pine stand at Pigeon Lake Road, near Mount Pleasant, city of Kawartha Lakes. Approximately 60% of the Scots pine had light levels of defoliation affecting 10% of foliage.

European fruit lecanium, *Parthenolecanium corni* (Bouche)

This exotic scale insect feeds on a variety of tree and shrub species but is most commonly encountered on oak, ash and maple throughout Ontario.

In 2011, European fruit lecanium was identified in Bancroft, Guelph and Pembroke districts. Large populations were detected causing trace levels of damage to white oak for approximately 5 km along Gold Lake Road and just north of North Rathbun Lake, Kawartha Highlands Signature Site Park, Bancroft District (Figure 3.16). Twig dieback was also noted on several individual trees, with European fruit lecanium affecting 20% of white oak in the near vicinity.

In Guelph District this insect was detected at low levels causing trace damage to plum near Ambleside and on red oak, along Station Hill Road, Renfrew County, Pembroke District causing light decline.

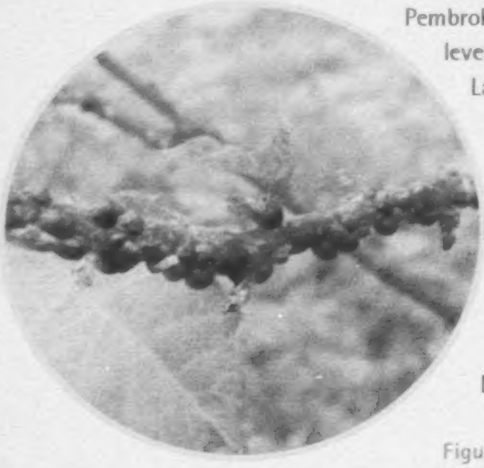
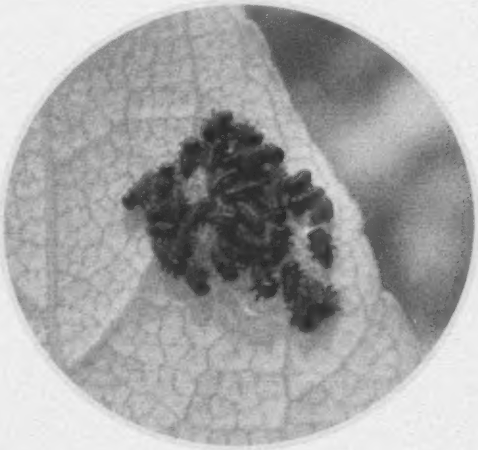


Figure 3.16 European fruit lecanium feeding on red oak (photo by P. Hodge).

Imported willow leaf beetle, *Plagiodera versicolora* (Laich.)

Both larval and adult stages of imported willow leaf beetle feed on willow foliage throughout Ontario. The larvae skeletonize the foliage while adult beetles feed on the entire leaf tissue (Figure 3.17).



Imported willow leaf beetle was recorded at light levels of defoliation on roadside willows along County Road 6 for 3 km northwest of Havelock, and on individual willows within the city of Peterborough, Peterborough District.

Low populations were also detected in Cooper Marsh Conservation Area, Raisin Region Conservation Authority, outside of South Lancaster, Kemptville District causing light defoliation to open grown willow species.

Figure 3.17 Larvae of the imported willow leaf beetle in Peterborough District (photo by P. Hodge).

Japanese beetle, *Popillia japonica* Newm.

Larvae of this exotic pest feed on the roots of turf, tree and shrub species while adult beetles feed on the upper leaf surface of many broad-leaved plant species in Ontario (Figure 3.18).

In Southern Region, adult Japanese beetles were detected on individual basswood and oak trees causing 80% defoliation in Oakville and Milton, Aurora District. In Kemptville District 20% defoliation was observed on hawthorn trees in the Ottawa area.

In Midhurst District north of Lake Simcoe and east of Georgian Bay mature white birch trees were 80% defoliated along roadways and tree lines adjacent to agricultural fields (Figure 3.19).

Figure 3.18 Adult Japanese beetle in Midhurst District (photo by S. McGowan).

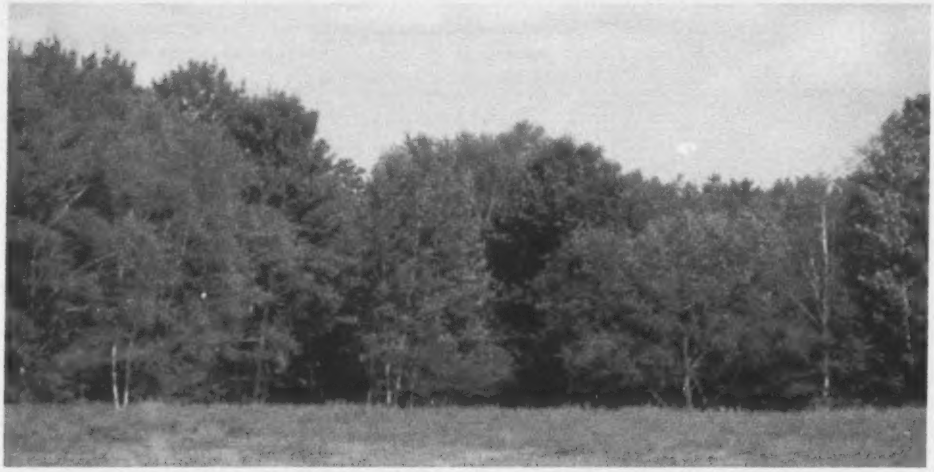


Figure 3.19 Severe defoliation on white birch caused by Japanese beetle in Midhurst District (photo by S. McGowan).

Pine shoot beetle, *Tomicus piniperda* (L.)

Pine shoot beetle (PSB) is native to Europe, North Africa and Asia and was first detected in North America in Ohio in 1992. It was discovered in Ontario in 1993. The adult beetles tunnel into the shoots, causing shoot mortality. The trunk of the tree is also attacked when the adults invade the trunk, mate in the cambial layer and then lay eggs. The larvae tunnel just under the bark. While this larval feeding can result in whole-tree mortality, it is usually only successful if the tree is under great stress.

This insect attacks all species of pines. The exception is white pine, on which the adults will attack the shoots but the insect prefers not to lay its eggs on the trunk.

Detection surveys in Ontario have confirmed PSB populations across Southern Region. Federal quarantines have been placed by CFIA on the movement of pine material from regulated areas to slow the spread of this pest (Figure 3.20). Since 1998, trace population levels have been detected along the southern edge of Northeast Region, specifically near Iron Bridge, Blind River, North Bay and Sturgeon Falls. So far in Ontario, tree mortality has mostly been limited to pine trees under stress from off-site planting, drought, flooding, poor canopy dominance, attack by other insects or root rot, or other factors. It is not yet known

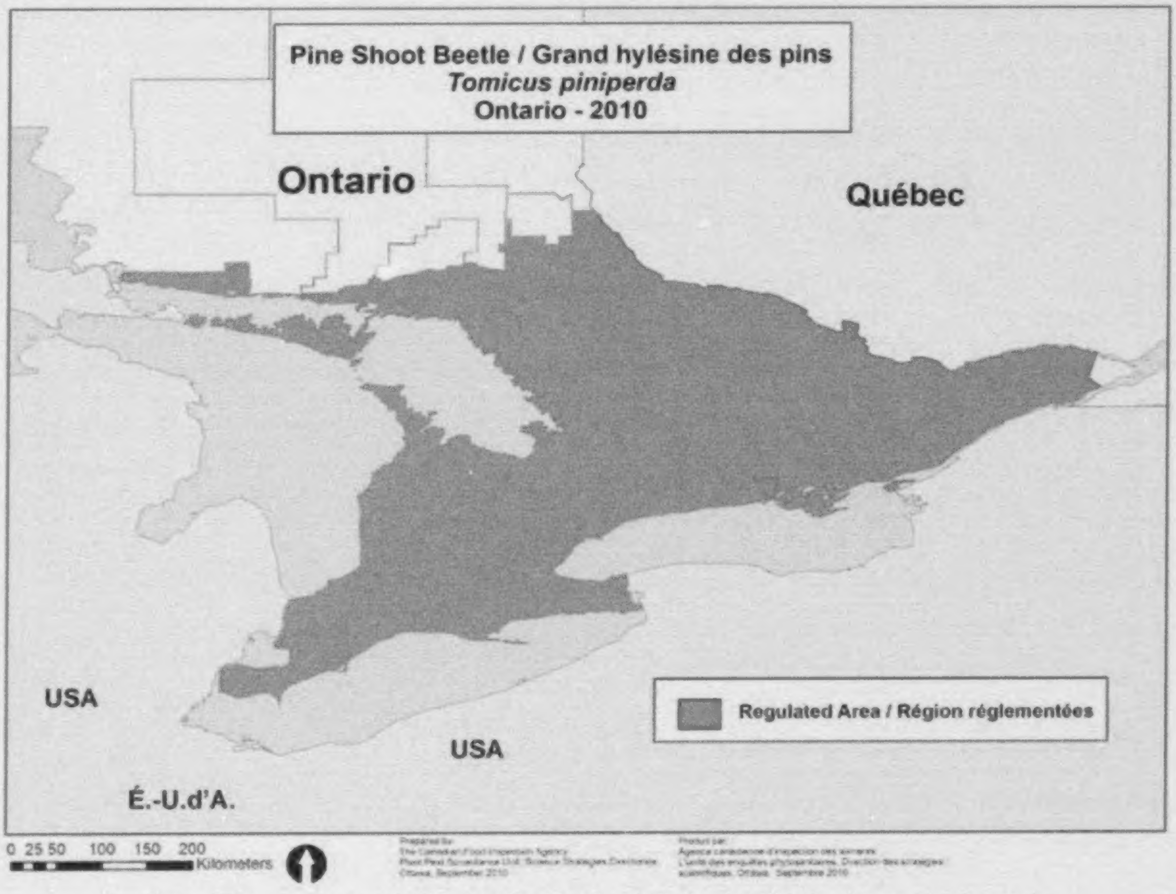

Pine Shoot Beetle / Grand hylésine des pins
Tomicus piniperda
Ontario - 2010
Ontario
Québec
USA
USA
É.-U.d'A.
Regulated Area / Région réglementées
0 25 50 100 150 200
Kilometers
Prepared by:
The Canadian Food Inspection Agency
Plant Pest Surveillance Unit, Science Strategies Directorate
Ottawa, September 2010
Produit par:
Agence canadienne d'inspection des aliments
L'unité des enquêtes phytosanitaires, Direction des stratégies scientifiques, Ottawa, Septembre 2010

Figure 3.20 Areas regulated for the pine shoot beetle by the Canadian Food Inspection Agency in Ontario in 2011.

whether PSB poses a significant threat to jack pine stands of northern Ontario. Stressors such as fire, drought, or defoliation by insects such as jack pine budworm or pine false webworm may make these stands vulnerable to PSB once the insect arrives in the north. Therefore, since 1999 the OMNR has conducted an annual detection and containment program to slow the spread of PSB into the stands of Northeast Region.

In 2011, a detection program was once again conducted by forest health monitoring staff. The goals of this detection program were: to confirm new positive results found in 2010; help detect population range extensions; and to monitor log yards and sawmills in the north and west sections of the province in the event that material moved to or from these areas may introduce this pest to previously non-infested areas.

The detection survey consisted of 39 eight-unit Lindgren funnel traps baited with myrtenol and trans-verbenol compounds deployed along the Hwy. 17/417 corridor from Sault Ste. Marie to the Ottawa Valley in Northeast and Southern regions (Figure 3.21).

Pine shoot beetle adults were collected and identified from 13 locations in 2011. Northeast Region had a total of 7 repeat positive trap locations from 2010 results and one new positive site. Southern Region had 4 repeat positive trap locations with one new positive site.

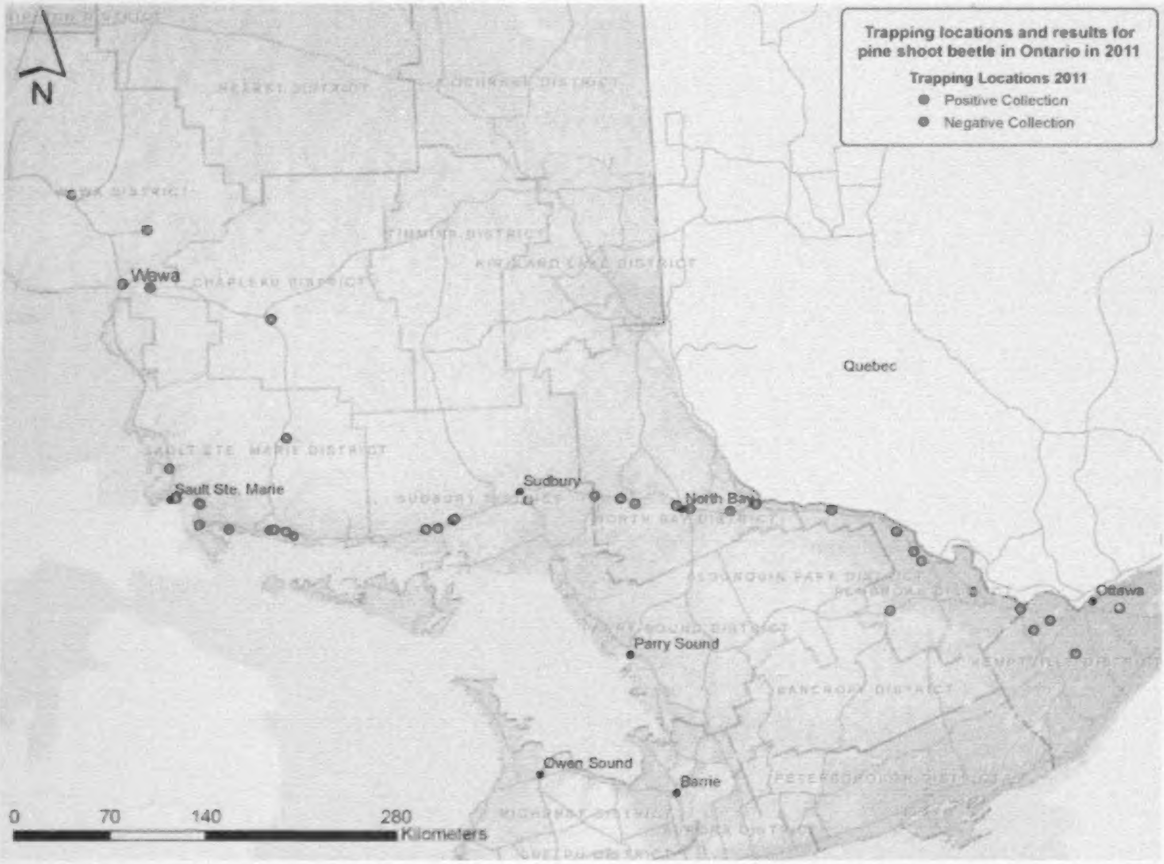

N
Trapping locations and results for pine shoot beetle in Ontario in 2011
Trapping Locations 2011
● Positive Collection
● Negative Collection
HEARST DISTRICT
COCHRANE DISTRICT
WAWA DISTRICT
Wawa
CHAPLEAU DISTRICT
TIMMINS DISTRICT
KIRKLAND LAKE DISTRICT
Quebec
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
Sudbury
SUDBURY DISTRICT
North Bay
NORTH BAY DISTRICT
ALGONQUIN PARK DISTRICT
PEMBROKE DISTRICT
Ottawa
PARRY SOUND DISTRICT
Parry Sound
KEMPTVILLE DISTRICT
BANCROFT DISTRICT
Owen Sound
Barrie
PETERBOROUGH DISTRICT
MIDHURST DISTRICT
AURORA DISTRICT
GUELPH DISTRICT
0
70
140
280
Kilometers

Figure 3.21 Trapping locations and results for pine shoot beetle in Ontario in 2011.

In Northeast Region, traps were placed in stands of Scots pine, red pine or jack pine in Chapleau, North Bay, Sault Ste Marie, Sudbury and Wawa districts. Positive trap collections were made within the city of Sault Ste Marie and Iron Bridge, Sault Ste Marie District. The positive trap location within the city of Sault Ste Marie was a new positive site and indicates a slight extension of the northern edge of the known infested area.

In Sudbury District, beetles were collected at Webwood, Espanola and Richard Lake southeast of the city of Sudbury. All of these locations have had periodic beetle catches in the past. In North Bay District beetles were captured at a single location east of the city of North Bay at LaVase Portage along Hwy. 17 east. This location has also had previous beetle catches.

In Southern Region, traps were placed in Kemptville and Pembroke districts in stands of red pine or Scots pine adjacent to or in close proximity to Hwy. 17/417. In Kemptville District, the beetle was captured in Gloucester, Marlborough and Pakenham townships. In Pembroke District positive traps were collected in Alice and Clara townships. The new positive trap capture was located within the federal quarantine area in Alice Township.

FOREST DISEASES

White pine blister rust, *Cronartium ribicola* J.C. Fisch.

White pine blister rust, a fungal disease introduced to North America from Europe in the early 1900's, is the most serious disease affecting eastern white pine across Ontario. The disease requires currant and gooseberry as an alternate host to complete the life cycle. In midsummer, spores from currant or gooseberry are carried on air currents and infect eastern white pine through the needles. The fungus spreads to the branch, causing yellow-orange fruiting bodies to develop, swelling, and heavy resin flow.

The following spring, yellow-orange blisters break through the thin bark and release yellow powdery spores. This disease cuts off nutrient flow, girdling branches and stems, and leads to mortality above the affected site. Symptoms include chlorotic foliage, dead branches and top mortality. Branches lower to the ground are considered to be more prone to infection, thus younger trees are at risk of mortality.

White pine blister rust is common throughout Ontario. In 2011 several infected sites were detected. Eastern white pines of all ages were exhibiting symptoms in Dryden, Red Lake, and Sioux Lookout districts, Northwest Region.

In Northeast Region occurrences were observed at the Gurd Research and Demonstration Area, and along the Sand Dam Road, near the Jocko area of North Bay District. Infection rates of less than 10% were observed at the Ingram Tree Improvement Centre, Kirkland Lake District, and in Gaudry Township, Sault Ste. Marie District.

Young plantations in Simcoe County, Midhurst District as well as Peterborough County, Peterborough District, Southern Region, were also detected as having low rates of the disease.

Dogwood anthracnose, *Discula destructiva* Redlin

Confirmed in Ontario for the first time in 1998, the causal agent of dogwood anthracnose is considered to be an introduced fungus that causes damage and mortality in eastern flowering dogwood throughout its range in Ontario.

Infection generally occurs during cool, moist conditions of the spring or fall and typically becomes established in leaves, spreading to twigs and branches. It causes dieback and mortality in the lower crown before spreading throughout the remainder of the tree.

Symptoms of dogwood anthracnose first appear on foliage, visible as small, light brown leaf spots. Healthy and necrotic foliar tissues are separated by a deep purple-brown ring (Figure 3.22).

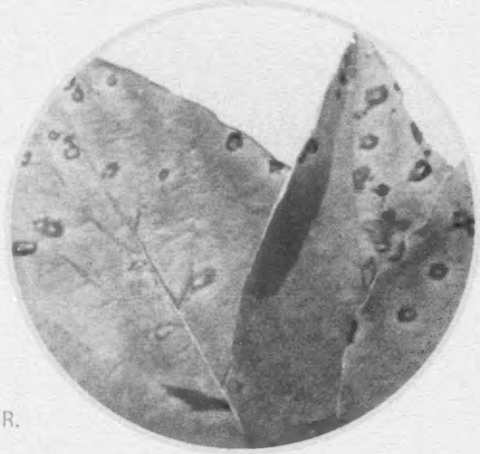


Figure 3.22 Leaf spots caused by dogwood anthracnose on eastern flowering dogwood in Aylmer District in 2011 (photo by R. Lidster).

Sometimes these leaf spots coalesce and form large, irregular lesions along the leaf's edge. Leaf spots may die off or merge causing premature leaf drop or shot-hole appearance in individual leaves. In severe cases, the disease may spread down the leaf petiole forming elliptical cankers. These cankers girdle the branches and eventually lead to decline and whole-tree mortality.

Surveys conducted in 2011 were carried out in known locations of eastern flowering dogwood to confirm the presence of dogwood anthracnose. Symptoms were observed this year across Aylmer and Guelph districts, with the disease confirmed on understory eastern flowering dogwood in the former Walsingham and Charlotteville townships, Norfolk County, as well as near the village of Wardsville in Southwest Middlesex, Middlesex County.

Beech bark disease, *Neonectria faginata* (M.L. Lohman, A.M.J. Watson & Ayers) Castl. & Rossman

Beech bark disease is the result of an insect-fungal pathogen complex that is initiated by the infestation of beech scale on American beech. As the insect and fungus become established in a stand they cause growth reduction, tree deformation, declines in wood quality and mast production, as well as premature tree mortality.

The scale insect will typically arrive first and increases in abundance over several years. It feeds on the sap of the tree by inserting its proboscis into the bark. The insect feeding creates an infection court through which the fungus can invade the tree.

Three phases of the disease are recognized as the advancing front, killing front, and aftermath stage. In the advancing front some scale insects can be found but very few fruiting bodies are visible. Along the killing front the trees are dying rapidly over large areas of forest, beech scale is obvious and red fruiting bodies can be found on some trees (Figure

3.23). In the aftermath zone trees can exhibit all levels of injury ranging from a few small cankers to whole-tree mortality. Several other micro-organisms and insects may also be found on affected beech trees during this phase.

In Southern Region, new locations of beech bark disease were identified in Parry Sound, Kemptville, Midhurst and Aylmer districts in 2011. These finds indicate beech bark disease has spread further west, south, and north of previously known locations. TO-date beech bark disease can be found in scattered locations across Southern Region. (Figure 3.24).

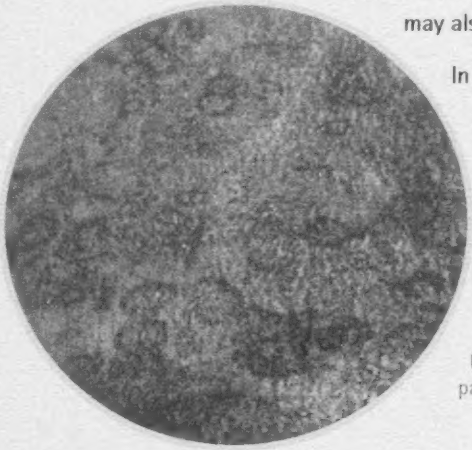


Figure 3.23 Mature American beech heavily infected with beech bark disease, showing lemon shaped patterns of fruiting bodies that are old (dark red-to-black), new (bright red), and parasitized (tan) (photo by W. Byman).

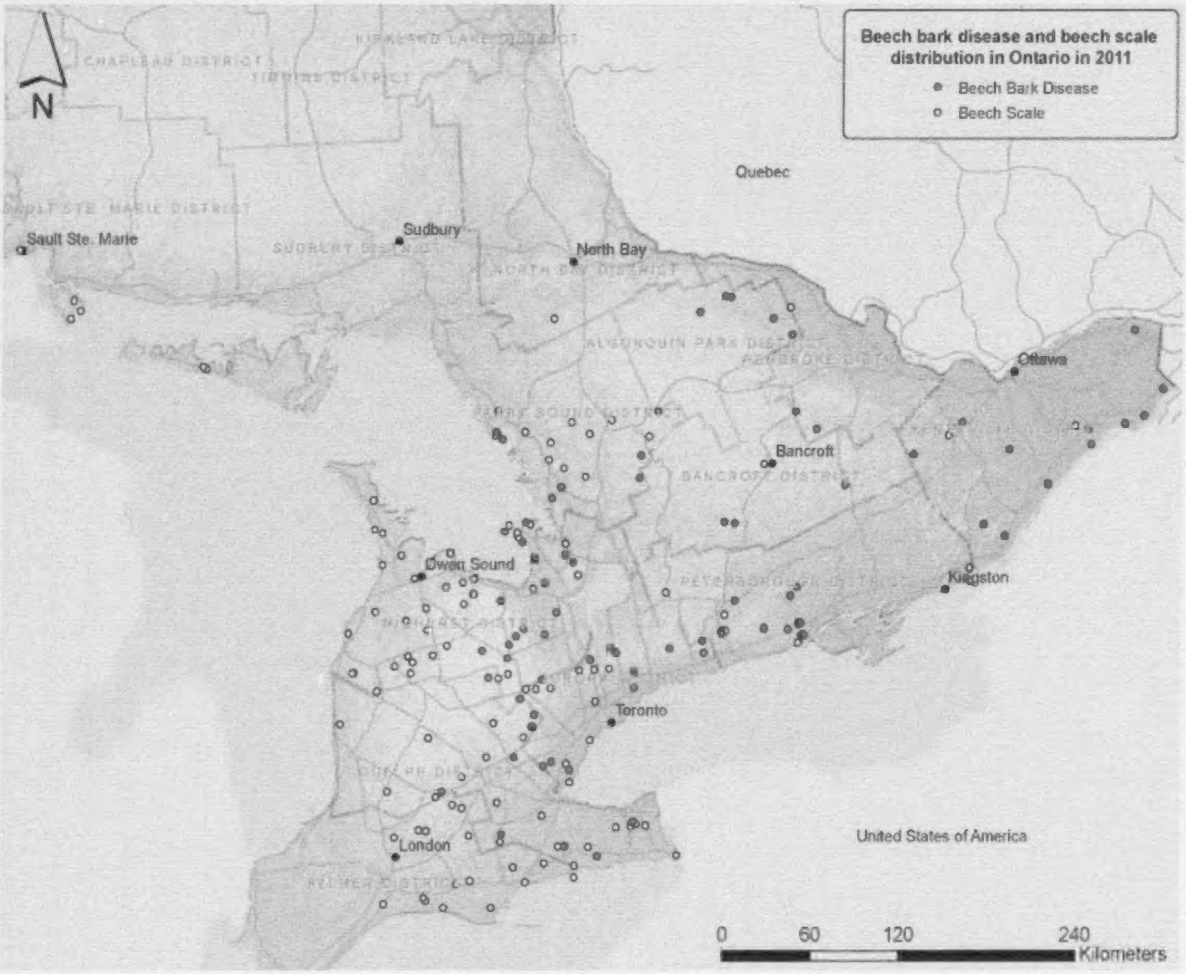

Beech bark disease and beech scale distribution in Ontario in 2011
● Beech Bark Disease
○ Beech Scale
N
CHAPLEAU DISTRICT
KIRKLAND LAKE DISTRICT
TIMMINS DISTRICT
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
Sudbury
SUDBURY DISTRICT
North Bay
NORTH BAY DISTRICT
Quebec
ALGONQUIN PARK DISTRICT
PEMBROKE DISTRICT
Ottawa
PARRY SOUND DISTRICT
Bancroft
BANCROFT DISTRICT
KEMPTVILLE DISTRICT
Owen Sound
MIDHURST DISTRICT
PETERBOROUGH DISTRICT
Kingston
AURORA DISTRICT
Toronto
GUELPH DISTRICT
London
AYLMER DISTRICT
United States of America
0
60
120
240
Kilometers

Figure 3.24 Beech bark disease and beech scale distribution in Ontario in 2011.

In Parry Sound District six new locations were identified including an area south of Bigwind Lake Provincial Park; in the areas of Wasauksing First Nation Parry Island, Bala, Baysville, and Killbear Provincial Park; and near Bear Lake on Hwy. 400 at Exit 174. Crown decline at these sites ranged from 50% to 100% with infections ranging from one tree to nearly all beech in the stand infected. In at least three sites trees leafed out normally this spring producing bright green foliage and appearing to have a strong vigour.

By mid-July, however, sections of the crown became chlorotic. Within 7-10 days leaves were brown and dead with portions of the crown in severe decline. Close inspection of the trunk revealed characteristic small, round, red fruiting bodies arranged in a lemon or football shape on the bark. Trees that have a portion of their crown killed by beech bark disease will not recover as this disease causes complete tree mortality.

Other new sites of beech bark disease were discovered in Matilda, Lavant Mill, Dalhousie & North Sherbrooke and Augusta townships, Kemptville District.

In Midhurst District new locations for the disease were discovered north and west of Shelburne, Dufferin County where several mature trees were affected.

In Springwater Forest (Elgin County, Aylmer District) all mature stems examined were showing signs of infection.

Dutch elm disease, *Ophiostoma novo-ulmi* Brasier

This Asian disease of elm was first introduced to North America in the early 1930's and quickly spread across eastern North America and into Ontario in the mid 1940's. Today, Dutch elm disease (DED) can be found throughout the natural range of elm in Ontario.

In 2011, weather played a large role in the development of DED as cool, moist, spring temperatures allowed for a high rate of spore development followed by hot, dry summer temperatures allowing insect vectors to colonize, breed and introduce spores to uninfected hosts. The main insect vectors carrying DED are the smaller European elm bark beetle

(*Scolytus multistriatus* (Marsham)) and the native elm bark beetle (*Hylurgopinus rufipes* (Eichhoff)) both of which colonize and breed within elm. The hot dry summer weather can also accelerate tree mortality because it exacerbates the effects of the fungus blocking the transport of water from the roots to the canopy.

DED was reported in Southern and Northeast regions in 2011, resulting in general crown reductions through twig and branch dieback and whole tree mortality (Figure 3.25)

In Southern Region, reports of DED were recorded in all districts with rates of infection ranging from light to severe. General observations of high infection rates were common across Pembroke, Kemptville, Midhurst, Aurora, Aylmer and Guelph districts.

In both Peterborough and Bancroft districts the disease occurred in isolated pockets with numerous mature elm trees succumbing to DED from North Kawartha Township to Hastings Township, Bancroft District, and along Hwy. 35 in the southern portions of the City of Kawartha Lakes, Peterborough District.

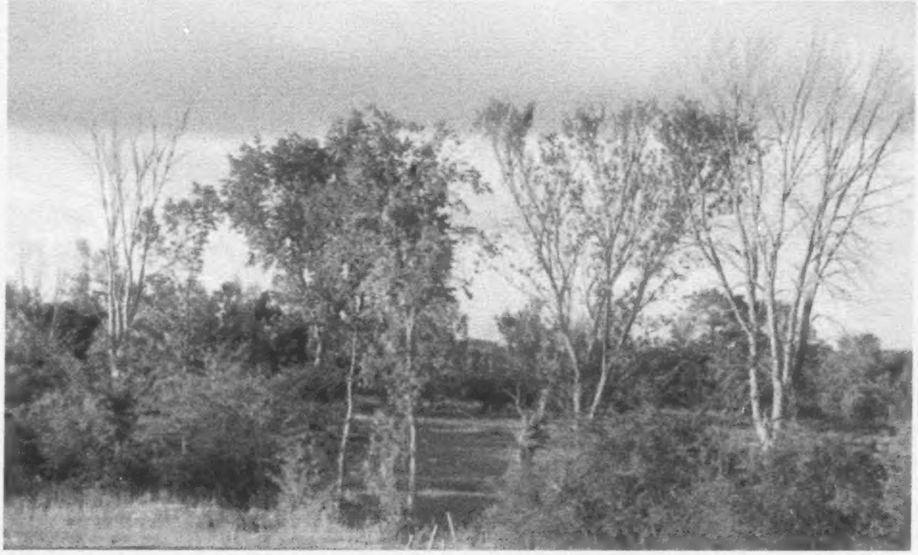
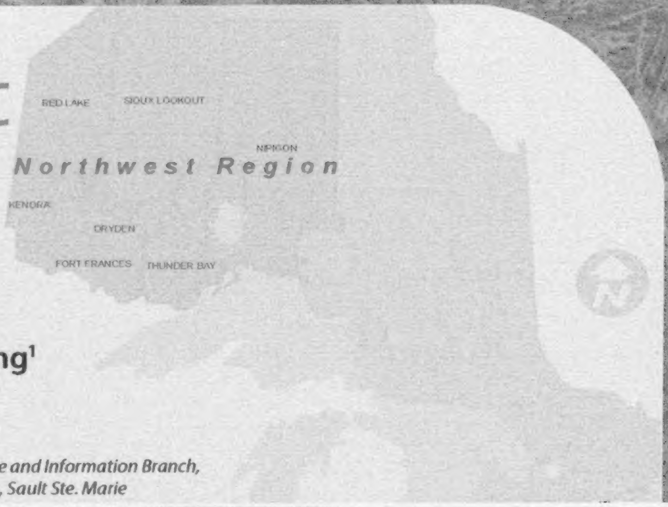


Figure 3.25 Severe decline and mortality of elm due to Dutch elm disease infection in southern Ontario in 2011 (photo by S. McGowan).

In Northeast Region, for the third consecutive year DED was commonly found in the city of Sault Ste. Marie in 2011 resulting in mortality of juvenile, semi-mature and mature elm species. Although infection rates were not quantified, DED appears to be continuing to increase in frequency and severity over the last three years in Sault Ste. Marie. Symptoms of DED were also visible along the Hwy. 17 corridor east of Sault Ste. Marie to Desbarats.

Mortality from DED was also noted on many roadside elm trees east of Sudbury from Warren to Verner along Hwy. 17, Sudbury District, Northeast Region.

Northwest Region



L. Rowlinson[1] and S. Young[1]

[1] Ontario Ministry of Natural Resources, Science and Information Branch, Inventory, Monitoring and Assessment Section, Sault Ste. Marie

SECTION

4

FOREST INSECTS

Bronze birch borer, *Agrilus anxius* Gory

Bronze birch borer was recorded in Dryden District in 2011 along Doreen Road in a semi-mature white birch stand. Nearly every tree in this 0.5 hectare (ha) stand had moderate levels of damage resulting in stunted leaf development, branch mortality and overall thinned crowns. Bronze birch borer was also observed in stands of white birch along Hwy. 599, just north of Ignace where a recent logging operation occurred. This operation removed the majority of conifer cover leaving several stands of residual white birch trees ranging in size from 0.5 - 2 ha. Mortality rates to the birch were recorded at 90% in the stands occurring in a 4 km stretch along Hwy. 599 (Figure 4.1). A small area of 6.5 ha of moderate-to-severe decline associated with bronze birch borer on white birch was also recorded just northwest of the town of Ignace.

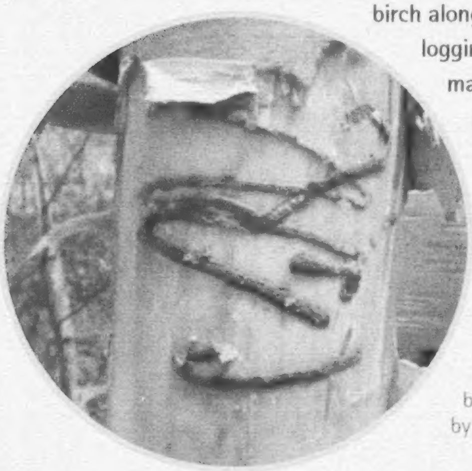
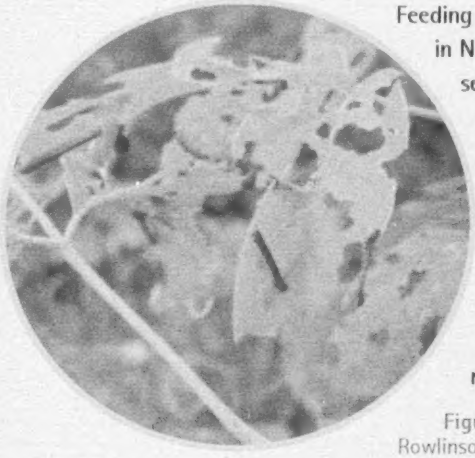


Figure 4.1 Larval galleries created by bronze birch borer causing decline and mortality to white birch (photo by S. Young).

Fall cankerworm, *Alsophila pometaria* (Harr.)



Feeding by this insect has been occurring at some level since 2008 in Northwest Region with all incidents occurring within urban settings. This early-season defoliator of many broadleaf species was recorded causing moderate-to-severe defoliation in Dryden, Kenora, Red Lake and Sioux Lookout districts during early June in 2011.

Within the city of Kenora, Kenora District, defoliation was recorded at severe levels on Manitoba maple and at moderate levels on ash (Figure 4.2). All affected hosts were open-grown landscape trees. No defoliation was recorded in natural stands on the outskirts of the city.

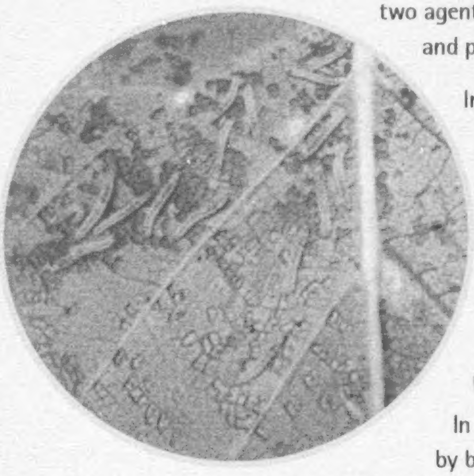
Figure 4.2 Fall cankerworm feeding on Manitoba maple (photo by L. Rowlinson).

In the city of Dryden, Dryden District, open-grown landscape Manitoba maple and silver maple trees experienced moderate-to-severe defoliation in northern sections of the city. In contrast, in the southern end of the city there were small, satellite pockets of light defoliation on basswood. The towns of Sioux Lookout (Sioux Lookout District) and Red Lake (Red Lake District) had light defoliation on open-grown Manitoba maple trees.

Birch skeletonizer, *Bucculatrix canadensisella* (Cham.)

This insect appears periodically across Ontario in large numbers. Although it seldom causes tree mortality, it can predispose birch to attack by other agents such as bronze birch borer (*Agrilus anxius* Gory).

Birch skeletonizer was widespread across Northwest Region in 2010 and 2011. In both years it often occurred in combination with Septoria leaf spot (*Septoria betulae* Pass). The two agents together caused yellowing and browning of the birch foliage, and premature leaf drop in the latter half of the growing season.



In 2011 moderate-to-severe defoliation was recorded across Dryden, Nipigon, Red Lake, Thunder Bay and Sioux Lookout districts (Figure 4.3). Defoliation became visible in early August across Northwest Region, continuing into September. Defoliation ranging from 50-100% could be detected on white birch north of Hwy. 17 with all trees appearing to be affected to some degree.

Figure 4.3 Birch skeletonizer larvae feeding on white birch foliage (photo by S.Young).

In 2010 in Thunder Bay District, moderate-to-severe defoliation by birch skeletonizer was reported mainly in the north eastern sections of Nipigon District. In 2011, defoliation was ubiquitous across the district ranging as far east as Manitouwadge and Wawa, Northeast Region, representing an increase in defoliation in Northwest Region.

Eastern larch beetle, *Dendroctonus simplex* (LeC.)

In Northwest Region, several pockets of dead and dying tamarack trees were mapped in Fort Frances and Kenora districts. A provincial total of 776 ha of severe decline and 676 ha of light decline were recorded in 2011. All moderate-to-severe decline was recorded in Fort Frances District in addition to 646 ha of light decline. Approximately 30 ha of light decline were also mapped in a satellite pocket in Kenora district (Figure 4.4).

Pockets of dead and dying tamarack were located within the area west of Fort Frances to Rainy River and north to Mathieu township on the south eastern shore of Lake of the Woods.

In Fort Frances District, severe decline was recorded in scattered locations throughout Blue, Dobie, Morley, Nelles, Pattullo and Worthington townships and to the north in Dewart, Pratt, Sifton, Sphon and Mathieu townships. The large Wild Land Reserve north of the Community of Rainy River also contained dead or dieing tamarack trees,

Affected pockets were mostly located on the edge of swamps or harvested areas. Ground surveys revealed severe infestations on most tree stems with galleries containing both adults and larvae. High water tables due to above normal precipitation may have caused a breakdown in the trees natural defences allowing for eastern bark beetle to brood within the trees live tissues.

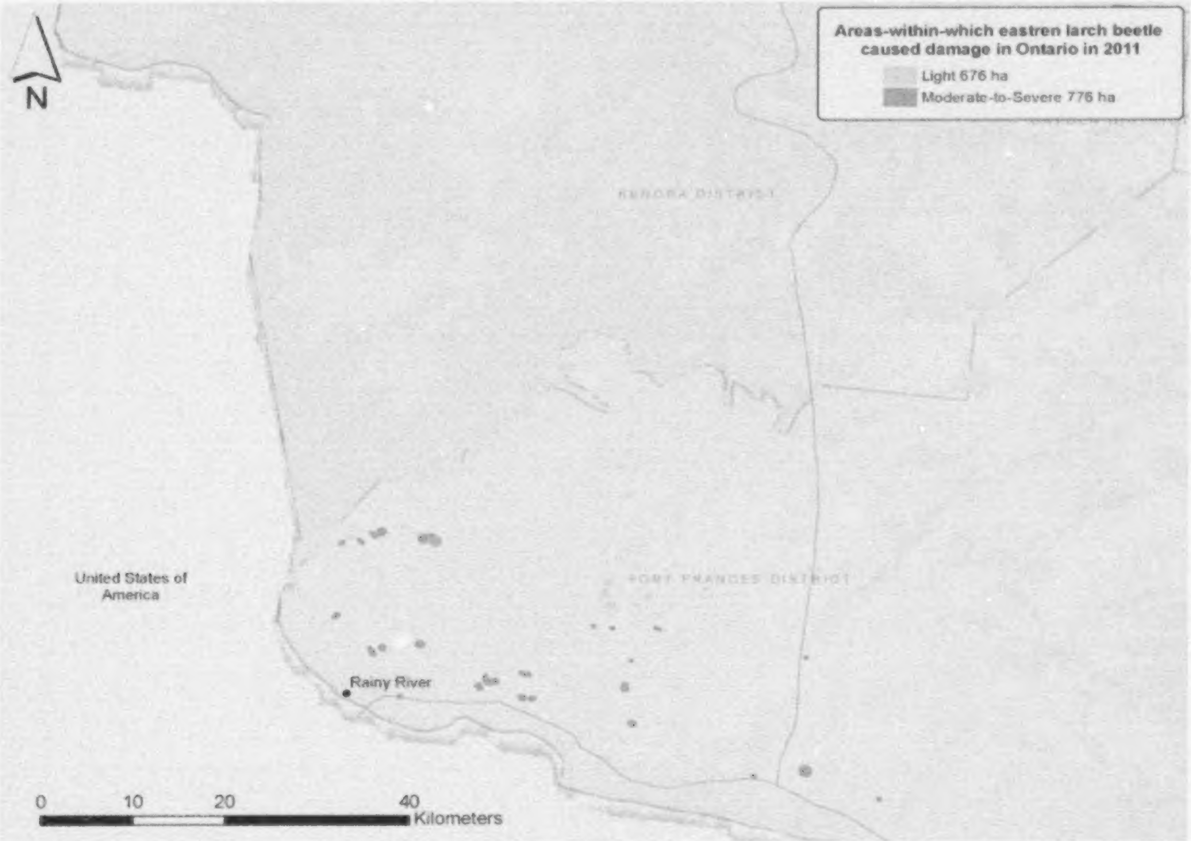
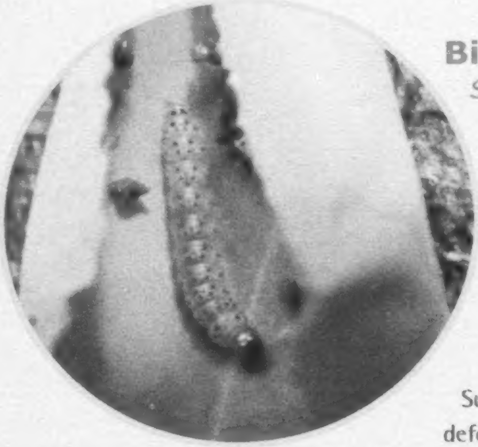

N
Areas-within-which eastren larch beetle caused damage in Ontario in 2011
Light 676 ha
Moderate-to-Severe 776 ha
KENORA DISTRICT
United States of America
FORT FRANCES DISTRICT
Rainy River
0
10
20
40
Kilometers

Figure 4.4 Areas-within-which eastern larch beetle caused decline and mortality to aspen in Ontario in 2011.



Birch-aspen leafroller, *Epinotia solandriana* (L.)

This insect pest of trembling aspen and birch was detected at several locations throughout Nipigon District in 2011 (Figure 4.5). As its name implies it creates tight leaf rolls in newly-developed foliage from which the insect feeds.

Figure 4.5 Birch-aspen leafroller larvae exposed from feeding chamber (photo by L. Rowlinson).

Surveys early in the season revealed varying levels of defoliation ranging from 5-100%. The most severely affected stand was located in Grain Township, Nipigon District, where a 0.5 ha stand of white birch suffered 100% defoliation by birch-aspen leafroller. Moderate-to-severe defoliation was recorded within 2 m of the stand edge in several semi-mature birch stands along Hwy. 11, east of the town of Nipigon and south along Goldfield Road between Geraldton and Terrace Bay, Nipigon District.

Striped alder sawfly, *Hemichroa crocea* (Geoff.)

Striped alder sawfly caused severe defoliation to roadside alder, white birch, trembling aspen, and balsam poplar at km 36 on North Road, Dryden District (Figure 4.6). The area affected was small, approximately 25 m by 50 m with near 100% defoliation of all host species.

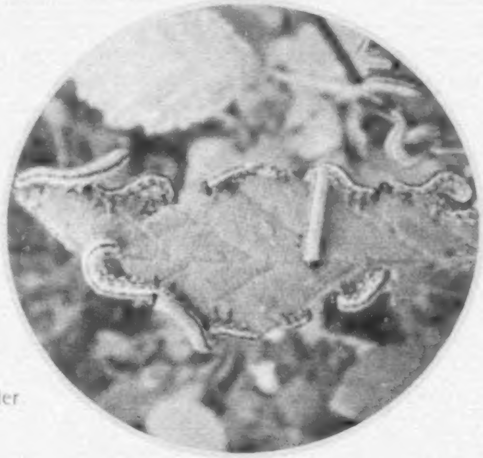


Figure 4.6 Striped alder sawfly larvae feeding on alder foliage (photo by S. Young).

Fall webworm, *Hyphantria cunea* (Drury)

This mid-to-late season defoliator of several deciduous tree species was detected at low levels causing light and moderate defoliation in Northwest Region. Damage was recorded in Dryden, Nipigon and Thunder Bay districts in 2011.

In Dryden District scattered single colonies were found to be causing moderate levels of defoliation to young white birch and trembling aspen as well as pin cherry and alder (Figure 4.7). In Nipigon and Thunder Bay districts trace levels of defoliation were noted on alder in small scattered satellite pockets.

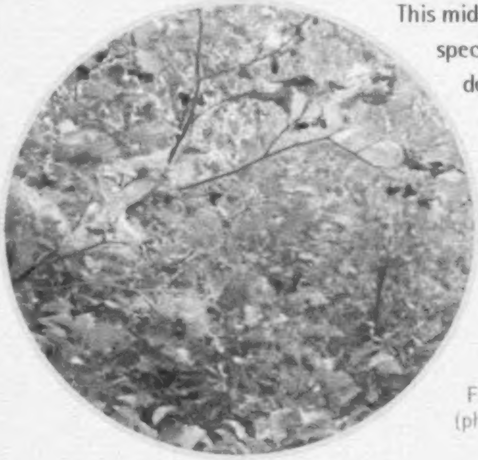
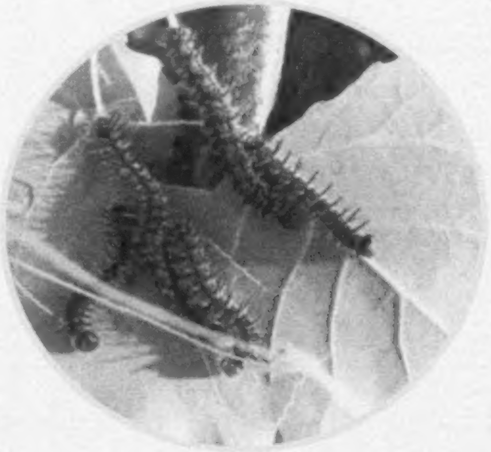


Figure 4.7 Webbing created by the fall webworm on alder (photo by L.Rowlinson).



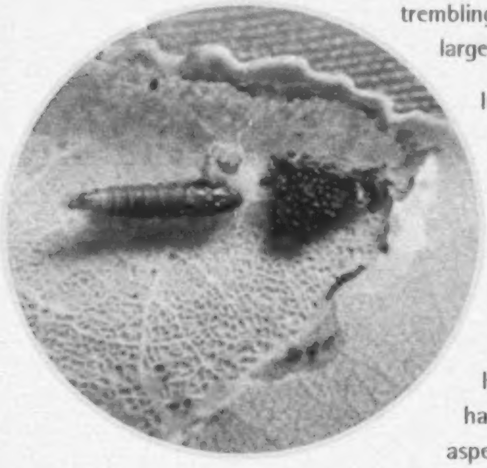
Spiny elm caterpillar, *Nymphalis antiopa* (L.)

This insect is the larval stage of the mourning cloak butterfly. It was found to be causing light-to-moderate defoliation on isolated roadside trembling aspen in Dryden and Sioux Lookout districts in 2011. Larvae were found feeding on trembling aspen ranging from 6-10 m in height (Figure 4.8). The feeding resulted in complete consumption of entire leaves, leaving only the petioles and some thicker veins. Defoliation was easily noticed on younger aspen where the larvae consumed entire sections of the crown leaving behind a very thin appearance to the foliage.

Figure 4.8 Spiny elm caterpillar larvae (photo by L.Rowlinson).

Aspen leafblotch miner, *Phyllonorycter apparella* (Free.)

This pest appeared throughout the southern half of Nipigon and Thunder Bay districts in late July and persisted throughout much of August in 2011 (Figure 4.9). Affected hosts were mainly understory, roadside and open grown trembling aspen with one occurrence noted on largetooth aspen .



In Dryden District varying low level populations dispersed throughout the district were noted to be causing severe defoliation on scattered individuals and small groups of trembling aspen. Affected trees in Dryden District ranged from 2 to 18 m tall with the largest area of contiguous defoliation detected in the Harris Crescent area where a 320 ha stand had severe defoliation on 100% of trembling aspen within the stand.

Figure 4.9 Aspen leafblotch miner pupa in excavated feeding chamber (photo by S.Young).

The heaviest defoliation in Thunder Bay District was observed along Boreal Road in Marks Township, southwest of Kakabeka Falls where a 20 year old stand approximately 5 ha in size suffered 100% defoliation.

Red Lake and Sioux Lookout districts also had similar defoliation patterns with the heaviest defoliation detected on young, scattered, roadside individuals. Elsewhere in Northwest Region, a stand of largetooth aspen 3 ha in size had <25% defoliation along Hwy. 17, east of Hwy. 71, Kenora District.

Balsam poplar leafblotch miner, *Phyllonorycter nipigon* (Free.)

In 2011 the majority of stands with a balsam poplar component within Dryden, Red Lake and Sioux Lookout districts had infestations of this insect with damage in Red Lake District being confined to southern sections of the district. Most affected stands experienced severe defoliation, up to 100% defoliation, with many affected leaves containing multiple larvae. Damage was observed on trees of all age and height classes and many experienced early leaf drop.

Northern pitch twig moth, *Petrova albicapitana* (Bsk.)

This insect is a common pest of young jack pine in Ontario. It causes a swollen appearance at branch nodes as larvae create habitat in which to feed and overwinter (Figure 4.10). Northern pitch twig moth was recorded on both young and mature jack pine in Northwest Region in 2011. During a plantation assessment in Red Lake District, 18% of trees evaluated had at least one incidence of northern pitch twig moth, with over half of the affected trees having the nodule located against the main stem. This insect can cause deformities in branches or stems where nodules are located.

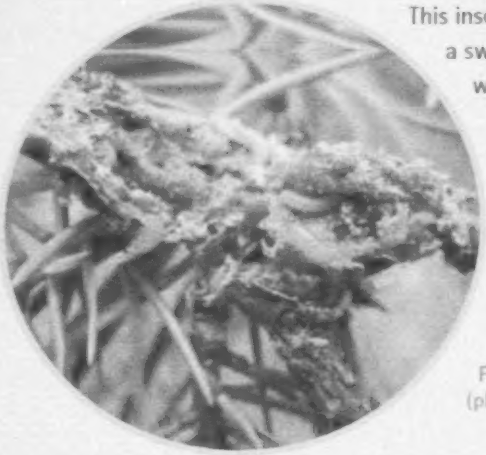


Figure 4.10 Excavated pitch nodule containing several larvae (photo by T. Williams).

Yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.)

Defoliation caused by yellowheaded spruce sawfly was noted within Red Lake, Sioux Lookout and Thunder Bay districts in Northwest Region in 2011.

Defoliation was scattered throughout Red Lake and Thunder Bay districts on roadside and open grown spruce regeneration. Defoliation levels varied from light to severe in affected areas with host trees less than 3 m tall being preferred.

Within the southern portion of Sioux Lookout District, this sawfly was detected at low level populations in the Goodie Lake Road area causing trace-to-light defoliation on up to 50% of trees sampled at the Skorban seed orchard to black spruce, Yellowheaded spruce sawfly was also recorded at two other seed orchards, Goodie north and Goodie south, where defoliation and population numbers were much less than those noted at Skorban orchard.

White pine weevil, *Pissodes strobi* (Peck)

White pine weevil, a common pest in jack pine plantations, caused light levels of damage in 2011 to a plantation in Red Lake District. Assessment of the plantation located at Kilometre

30 on Nungessor Road revealed 22% of the trees were affected by white pine weevil. Damage to affected trees consisted of dead leaders including previous year's increment (Figure 4.11). The trees in this plantation average 2.2 m tall and were 9 years old.

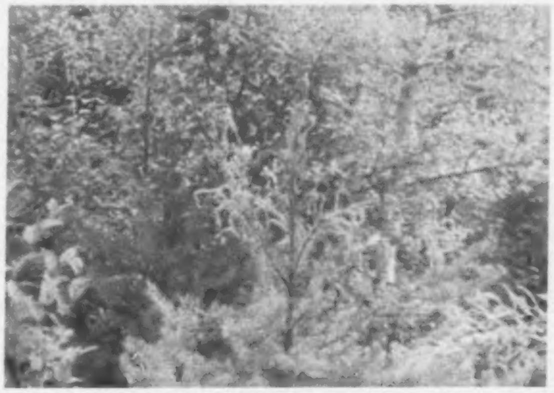
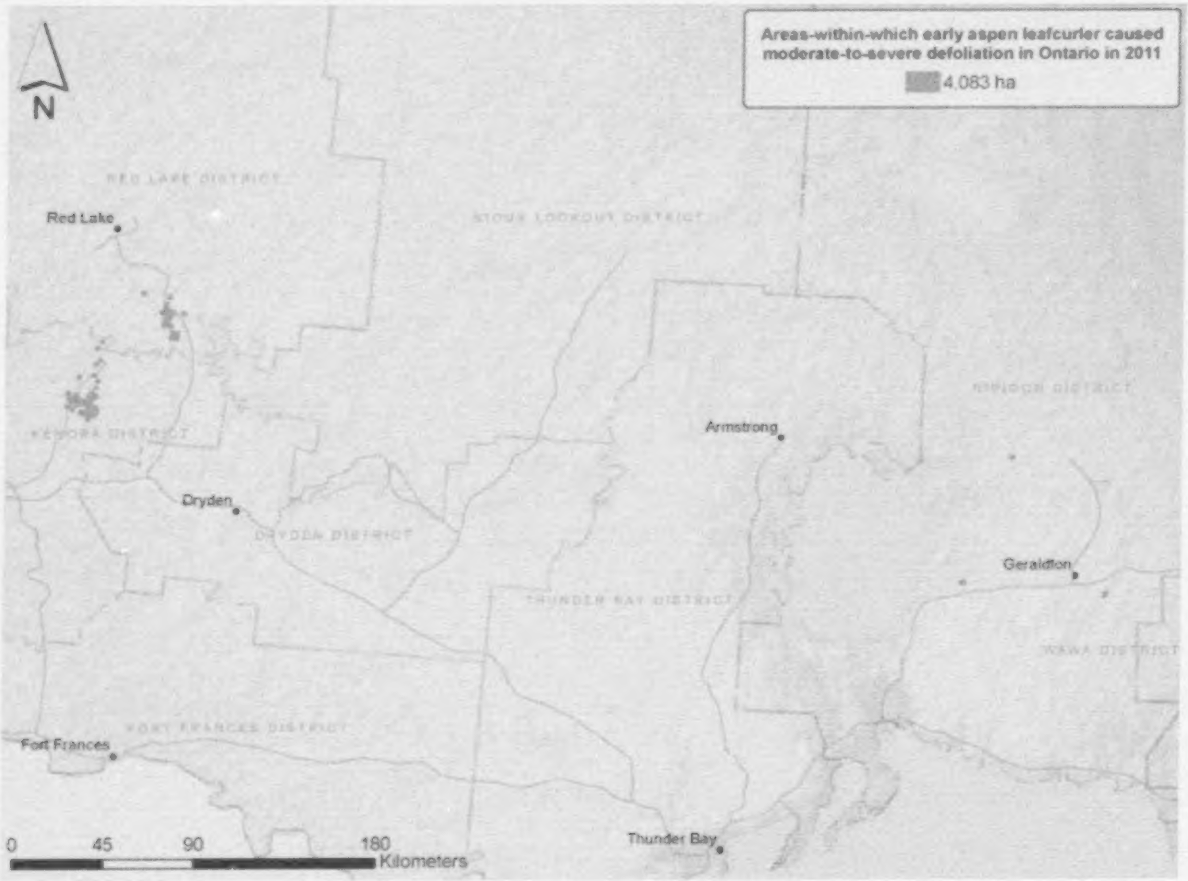


Figure 4.11 Current year's damage to roadside jack pine regeneration by white pine weevil (photo by L. Rowlinson).

Early aspen leafcurler, *Pseudexentera oregonana* (Wlsm.)

Larvae of this pest conceal themselves inside tightly rolled leaves which provide shelter as they feed. During June of 2011, this insect caused a total 4,083 ha of moderate-to-severe defoliation in trembling aspen stands in Kenora, Red Lake, and Nipigon districts (Figure 4.12).



Areas-within-which early aspen leafcurler caused moderate-to-severe defoliation in Ontario in 2011
▨ 4,083 ha
N
RED LAKE DISTRICT
Red Lake
SIOUX LOOKOUT DISTRICT
NIPIGON DISTRICT
KENORA DISTRICT
Armstrong
Dryden
DRYDEN DISTRICT
Geraldton
THUNDER BAY DISTRICT
WAWA DISTRICT
FORT FRANCES DISTRICT
Fort Frances
Thunder Bay
0
45
90
180
Kilometers

Figure 4.12 Areas-within-which early aspen leafcurler caused moderate-to-severe defoliation in Ontario in 2011.

In Kenora District, 2,262 ha of moderate-to-severe defoliation and 9 ha of light defoliation were mapped along the Jones Portal Road around Grassy Narrows First Nation and Indian Lake; along the east shores of the English River system at Ball Lake; north along the southern shores of Maynard Lake; and in small pockets north and south of Oak Lake and south of Unexpected Lake.

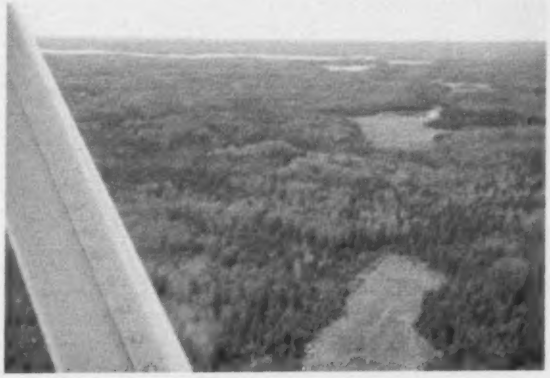


Figure 4.13 Aspen crowns affected by early aspen leafcurler (photo by T. Straight).

Defoliation by this insect in Red Lake District was mapped between the southern shore of Rice Lake and the southeast shore of Pakwash Lake, west of Hwy. 105 contributing 1,655 ha of moderate-to-severe defoliation to the overall total (Figure 4.13).

Moderate-to-severe defoliation totalling 145 ha in Nipigon District was spread over a much smaller area affecting aspen stands along Goldfield Road, south of Longlac. Although early aspen leaf curler was the primary defoliator in these stands, multiple leaftiers were also present and contributing to the defoliation. Observed leaftiers included aspen criddleana (*Epinotia criddleana* Kft.)) and yellowheaded aspen leaftier (*Epinotia nisella* (Cl.)).

Poplar borer, *Saperda calcarata* Say

The majority of feeding by this insect takes place deep within the heartwood and sapwood of host trees resulting in large galleries within the tree (Figure 4.14). These galleries commonly open to the outside of the tree creating openings that act as entry points for disease such as hypoxylon canker (*Entoleuca mammata* J. D. Rogers & Y. M. Ju). These galleries also greatly weaken the host tree predisposing it to stem snap.

During 2011 incidents of this insect seemed to be high with stands of trembling aspen and balsam poplar being affected throughout Dryden, Kenora, Red Lake and Sioux Lookout districts.

Damage ranged from single tree infestation to large groups of trees within stands. Most affected by this insect were stands in Dryden District near the city of Dryden and the community of Vermillion Bay that had been mapped in 2010 as having the greatest level of aspen decline. Stands with similar levels of damage also extended into the northeast corner of Kenora District. In spite of this large area of incidents, current mortality and dieback associated with this insect was considered to be low in 2011

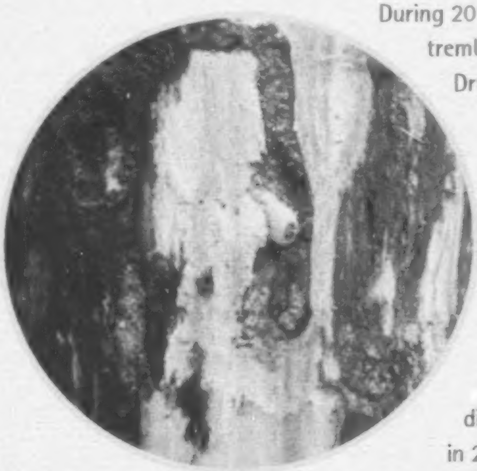


Figure 4.14 Poplar borer in excavated larval gallery (photo by L. Rowlinson).

FOREST DISEASES

Armillaria root rot, *Armillaria* spp.

Armillaria root rot was recorded in jack pine forest health monitoring plots in all districts in Northwest Region, with the exception of Thunder Bay and Nipigon districts in 2011.

Dry, hot conditions were experienced across Northwest Region in 2011 and may have played a favourable role in fungal development of this disease. Affected individuals in many cases appeared to be healthy during early season surveys but had succumbed to the disease by mid-summer.

Dryden, Fort Frances, Kenora, Red Lake and Sioux Lookout all had permanent sample plots with root rot-caused mortality during 2011. Surveys of these plots revealed a 4% tree mortality rate of the jack pine in 2011 of which 34% succumbed to armillaria root rot. Trees in many of these plots are reaching a mature to over-mature age class and showing signs of stress. These conditions appear to be allowing the opportunistic armillaria root rot to breach the defence mechanisms of the host trees.

Ink spot of aspen, *Ciborinia whetzelii* (Seaver) Seaver

Ink spot of aspen was readily detected throughout Dryden and Sioux Lookout districts in trembling aspen stands at light-to-moderate levels in 2011. Evidence of infection became noticeable in the last few days of June and intensified over the following few weeks (Figure 4.15).

In Dryden District, areas around Ohman Road, north of Ignace, had noticeable levels of infection. Symptoms of the disease were also noticeable along Hwy. 72 corridor north from Dinorwic, Dryden District to the Sioux Lookout District boundary.

In Sioux Lookout District, this disease continued along Hwy. 72 corridor from Dryden District Boundary north to Stanzhikimi Road on Hwy. 516. Aspen stands along Vermilion River Road north to Idaho Road also had noticeable levels of infection. Approximately 15-25% of the aspen foliage was affected. Infection levels were not advanced enough to be mapped during aerial surveys but incidence levels became more visible as the season progressed.

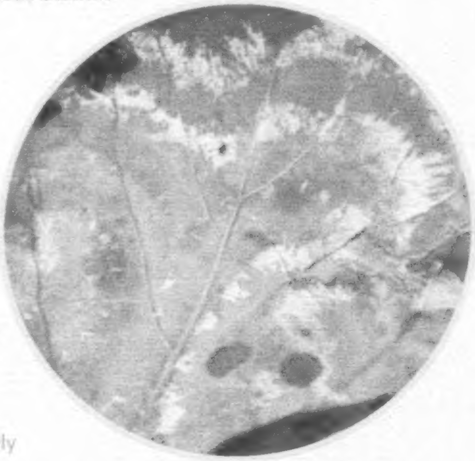


Figure 4.15 Desiccated foliage of aspen severely affected by ink spot (photo by S. Young).

Fusicoccum canker of balsam fir, *Fusicoccum abietinum* (Hartig) Prill. & Delacr.

Fusicoccum canker of balsam fir was sampled on understory balsam fir in a jack pine health plot at Km 8 on South Bay Road, Red Lake District. The overstory at this location consisted of over-mature jack pine with an understory of mainly balsam fir and black spruce. The incidence of the disease on the balsam fir at this location was high as most individuals had dead branch tips, commonly referred to as flagging. Damage at the individual tree level was classed as moderate with multiple branches affected on each tree. Affected trees ranged in height from 1-5 m.

Western gall rust, *Peridermium harknessii* J.P. Moore

Cool temperatures and above-average rainfall during April and May 2011 may have been contributing factors to the seemingly high prevalence of this disease in jack pine forests of Northwest Region (Figure 4.16). Abundant new infections of western gall rust disease occurred in Dryden, Nipigon and Red Lake districts in 2011.

Dryden District staff reported widespread incidence of this disease in young to semi-mature trees. This was later confirmed during routine ground checks in conjunction with District staff observations.

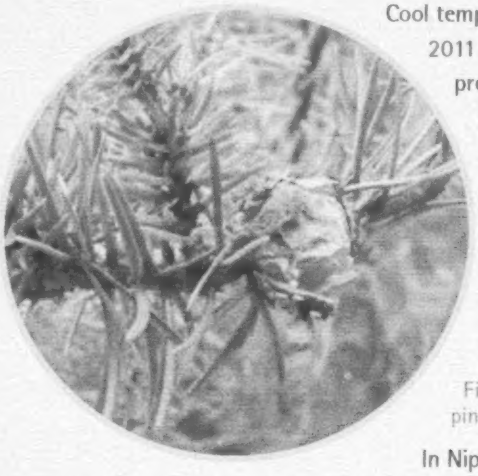


Figure 4.16 Sporulating gall of western gall rust on young jack pine tree (photo by L. Rowlinson).

In Nipigon District this disease was recorded in 15 to 20 year old plantations along Goldfield Road between Terrace Bay and Geraldton. In all plantations throughout this area the bright orange glow of new infections could be easily noticed on the mid to lower third of affected crowns. At the north end of Goldfield Road a small 0.25 ha stand of 25 year old jack pine had 10-25% infection by this disease on more than 25% of the trees.

Plantation surveys in Red Lake District revealed a 9 year old plantation with moderate-to-severe infection levels with 23% of plantation trees being infected.

FOREST ABIOTIC EVENTS

Aspen decline

Over the past 5 years, trembling aspen and balsam poplar stands in northern areas of the province have experienced a severe decline and rebound in health and vigour. In 2011, aspen decline was recorded at 3,117 ha of moderate-to-severe decline, a major reduction from the 15.9 million ha of light and moderate-to-severe decline recorded in 2010 (Table 4.1).

Table 4.1 Area of moderate-to-severe aspen decline in Northwest Region 2008-2011.

Region	Area of Decline (ha)				
District	2008 (M-S)*	2009 (M-S)	2010 (M-S)	2010 (Light)	2011 (M-S)
Northwest					
Dryden	0	702,384	136,201	1,962,395	609
Fort Francis	0	2,030,714	9,571	1,769,223	155
Kenora	0	600,631	193,559	1,241,057	0
Nipigon	1,561	22,013	1,440,507	1,951,221	17
Red Lake	0	95,035	41,557	747,380	1,068
Sioux Lookout	0	7,080	0	2,575,076	1,112
Thunder Bay	308	315,307	1,292,737	2,520,692	155
Total	**1,869**	**3,773,164**	**3,114,134**	**12,767,043**	**3,117**

** M-S = Moderate-to-severe decline, Light = Light decline*

No definitive answer has been determined as to why large scale decline to aspen has occurred but several factors appear to have contributed to the decline of these stands. These factors include defoliation and stem attack by a host of different insects, drought, low winter snowfall with root freezing, various stem diseases, and competition from understory conifer trees..

The reason for the increase in health and vigour of these stands in 2011 is unclear. However, cooler spring temperatures and average to above-average rainfall levels seemed to have helped in the recovery of trembling aspen and balsam poplar stands in Northwest Region.

The general decline of trembling aspen and balsam poplar in Northwest Region began in 2008. A total area of 1,869 ha of moderate-to-severe decline was recorded in areas confined to Nipigon and Thunder Bay districts. This quickly became a large event in 2009 as widespread aspen decline reached 3.7 million ha of moderate-to-severe decline. In 2010, 12.7 million ha of light decline was observed in all districts in Northwest Region with an additional 3.1 million hectares of moderate-to-severe decline recorded in all but Sioux Lookout District.

Light decline consisted of thin looking aspen trees with small foliage and some branch mortality, while aspen stands with moderate-to-severe decline had sparse foliage, more dead branches, and also included additional top mortality as well as whole-tree mortality.

In 2011 the decline could no longer be easily detected on the landscape with only 3,117 ha (Figure 4.17) of moderate-to-severe decline dispersed throughout Dryden, Fort Frances, Nipigon, Red Lake, Sioux Lookout and Thunder Bay districts, Northwest Region.

Most of the aspen decline in 2011 occurred in Sioux Lookout District with 1,112 ha of moderate-to-severe decline. This area was concentrated in the central portion of the district between Root River and Leether Lake and further to the east between Carling Lake and Yet Lake. In the southern portion of the district, three pockets of decline were recorded between Richardson Lake and Lost Lake. One pocket occurred near Muskie Lake, Echo Township. In addition, a provincial total of 372 ha of aspen mortality caused by aspen decline was mapped in Sioux Lookout District in 2011 (Figure 4.18).

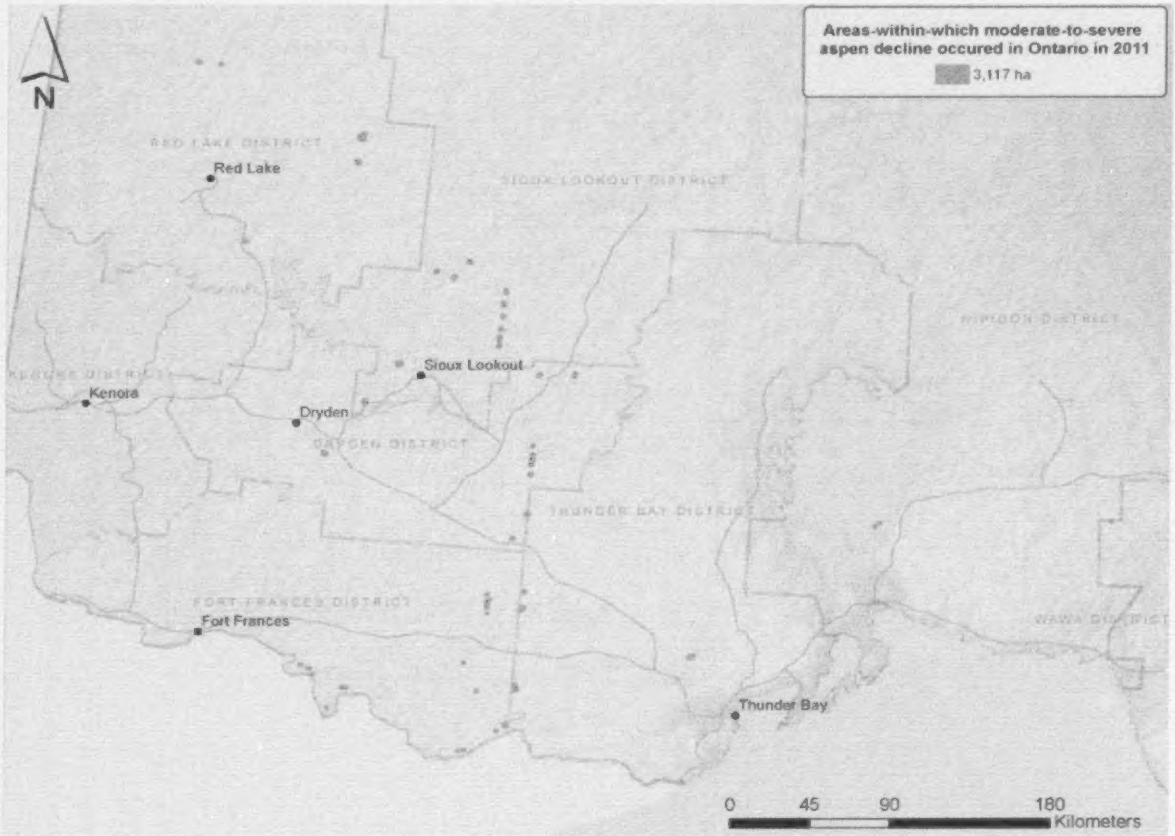

Areas-within-which moderate-to-severe aspen decline occured in Ontario in 2011
▨ 3,117 ha
N
RED LAKE DISTRICT
Red Lake
SIOUX LOOKOUT DISTRICT
NIPIGON DISTRICT
KENORA DISTRICT
Kenora
Sioux Lookout
Dryden
DRYDEN DISTRICT
THUNDER BAY DISTRICT
FORT FRANCES DISTRICT
Fort Frances
WAWA DISTRICT
Thunder Bay
0 45 90 180
Kilometers

Figure 4.17 Areas-within-which aspen decline caused moderate-to-severe damage to aspen in Ontario in 2011.

In Dryden District, a total area of 609 ha of aspen decline was recorded between Dinorwic Lake and Wabigoon Lake in the central portion of the district. On the east side of Dryden District, satellite pockets of decline were scattered between Davies and Sturgeon lakes near Sioux Lookout District border and Corman Township.

In Fort Frances District, a total of 155 ha of moderate-to-severe aspen decline was recorded in 2011. This is an ongoing improvement from 2009 and 2010 as moderate-to-severe aspen decline declined from approximately 2 million ha in 2009 to 9,571 ha in 2010. Aspen decline was mapped in the southern portions of the district at the Ontario-Minnesota border along the north shores of Namakan Lake and Lac La Croix and further to the east where decline was mapped between Knife Lake and Saganaga Lake. Along the Fort Frances-Thunder Bay district border, scattered pockets of decline were also recorded between Bud Lake and Beg Lake; on the southern side of Lemay Lake; and between Farley Lake and Melema Lake.

In Thunder Bay District, 155 ha of moderate-to-severe decline were recorded along the Fort Frances District border. This damage consisted of 6 satellite pockets of aspen decline between Mosher Lake and Lost Moose Lake in the north and Wawiag River and Clay Lake in the south.

Nipigon District had the largest reduction in aspen decline with a drop of 1.4 million ha to a 2011 total of only 17 ha of mapped damage.

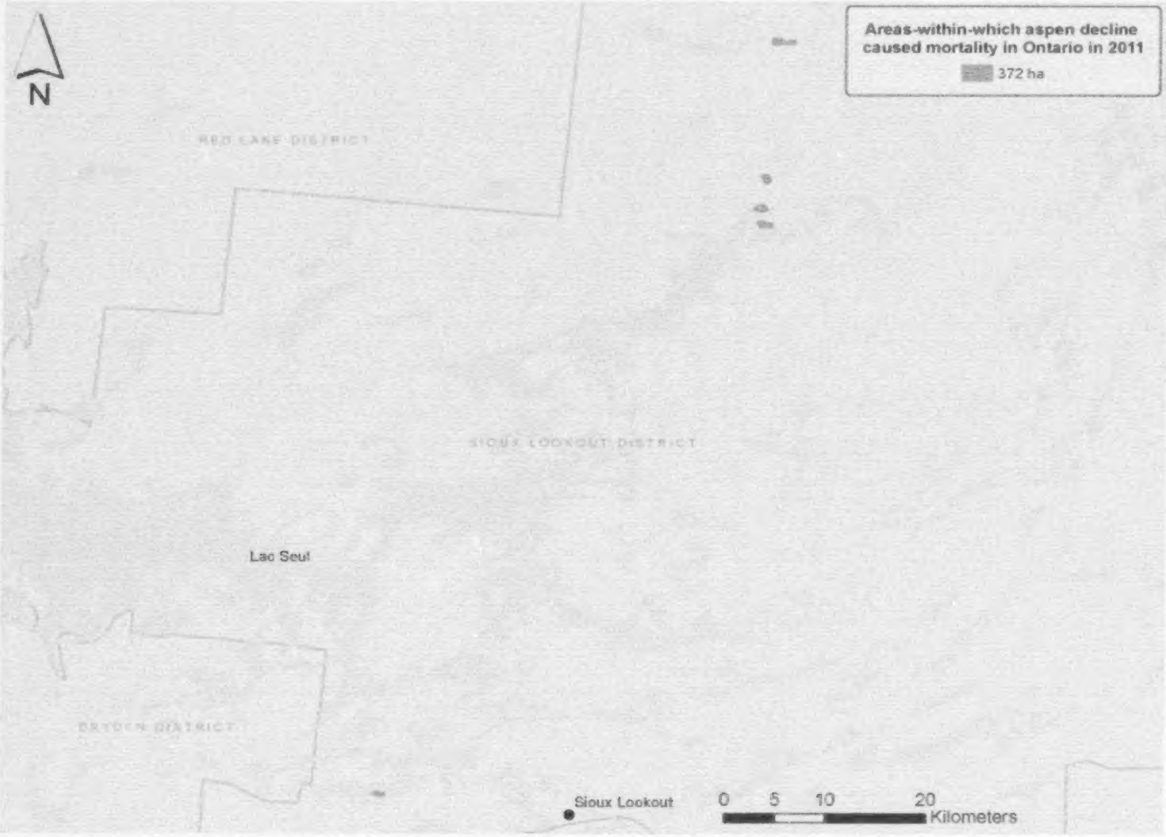

N
Areas-within-which aspen decline caused mortality in Ontario in 2011
▨ 372 ha
RED LAKE DISTRICT
SIOUX LOOKOUT DISTRICT
Lac Seul
DRYDEN DISTRICT
Sioux Lookout
0 5 10 20
Kilometers

Figure 4.18 Areas-within-which aspen decline caused mortality to aspen in Ontario in 2011.

Drought/Scorch

A total 616,372 ha of drought damage was recorded in Dryden, Kenora, Red Lake and Sioux Lookout districts surrounding Lac Seul in 2011 (Figure 4.19). Damage began to appear in mid-July when ferns and grasses started to dieback followed by yellowing, scorched and shrivelled foliage of overstory trees. White birch was first to display symptoms followed soon after by alder, aspen (Figure 4.20) and coniferous species Figure 4.21).

In Sioux Lookout District drought damage was recorded at 360,900 ha of moderate-to-severe damage resulting in red foliage and early leaf and needle drop. The affected trees were in a swath approximately 50 km wide beginning in the east near Hwy. 516 at Yet Lake and Foley Lake and extending west to the borders of Red Lake and Dryden districts on both the north and south sides of Lac Seul.

This continued into Red Lake District where 177,645 ha of moderate-to-severe drought-induced defoliation were recorded. Damage extended from the southeast corner of Knott Township to the northeast shore of Pakwash Lake and crossing the district border into Sioux Lookout District near Sunlight Lake. The southern boundary of this damage in Red Lake District was along the border shared with Kenora District along the Anishinabi River and west of Wine Lake.

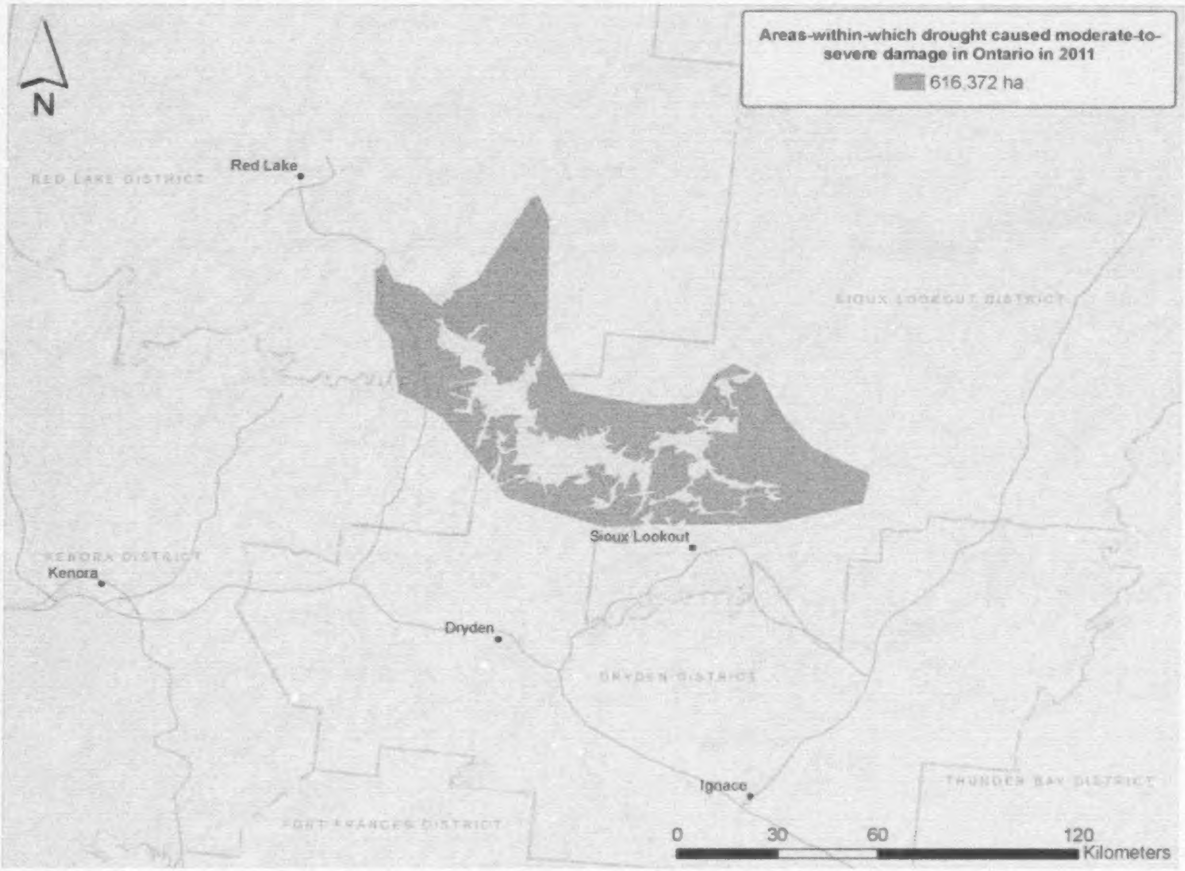

Areas-within-which drought caused moderate-to-severe damage in Ontario in 2011
▨ 616,372 ha
N
RED LAKE DISTRICT
Red Lake
SIOUX LOOKOUT DISTRICT
Sioux Lookout
KENORA DISTRICT
Kenora
Dryden
DRYDEN DISTRICT
Ignace
THUNDER BAY DISTRICT
FORT FRANCES DISTRICT
0
30
60
120
Kilometers

Figure 4.19 Areas-within-which drought caused moderate-to-severe damage in Ontario in 2011.

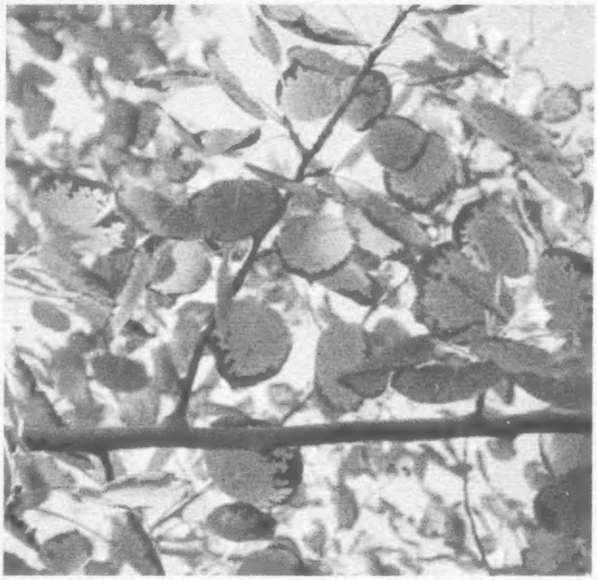


Figure 4.20 Foliage of aspen trees showing the effects of drought (photo by S. Young).

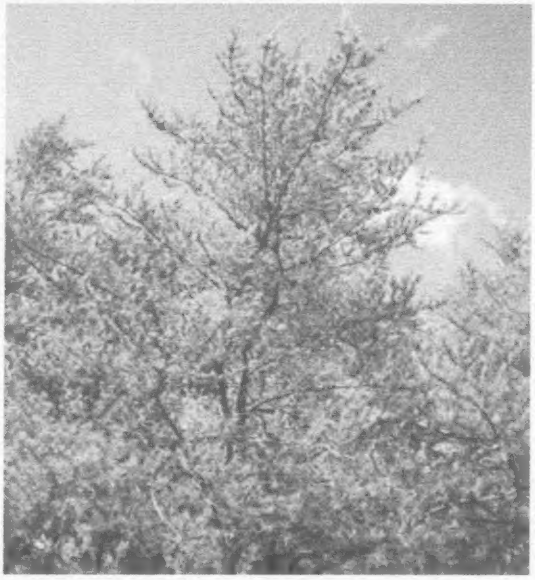


Figure 4.21 Jack pine tree experiencing premature needle drop due to drought conditions (photo by S. Young).

In Dryden district an area approximately 15 km wide, extending across the most northerly portion of the district, was recorded at 56,622 ha of moderate-to-severe damage. This damage extended from Sioux Lookout District along the north shore of Webster Bay on Lost Lake and crossed into Kenora District along the south shore of Glider Lake, extending north to the southern shore of Lac Seul.

A total of 21,205 ha of moderate-to-severe drought damage was recorded in Kenora District in 2011. This was recorded from Glider Lake to the Red Lake District border at Wine Lake.

Snow damage

In Dryden District snow fall accumulation over the month of February caused a total of 33 ha of severe damage to overstory jack pine and spruce stands of various age classes. Damaged pockets consisted of broken tops, bent-over stems, and stems broken 4-10 feet off the ground (Figure 4.22). Pockets of snow damage were relatively small and infrequently distributed across the landscape. Red Lake, Sioux Lookout and Dryden districts all had multiple, scattered pockets of snow damaged with areas in the 0.5 ha to 4 ha range with two larger areas consisting of 19 ha of severe damage in Dryden District.

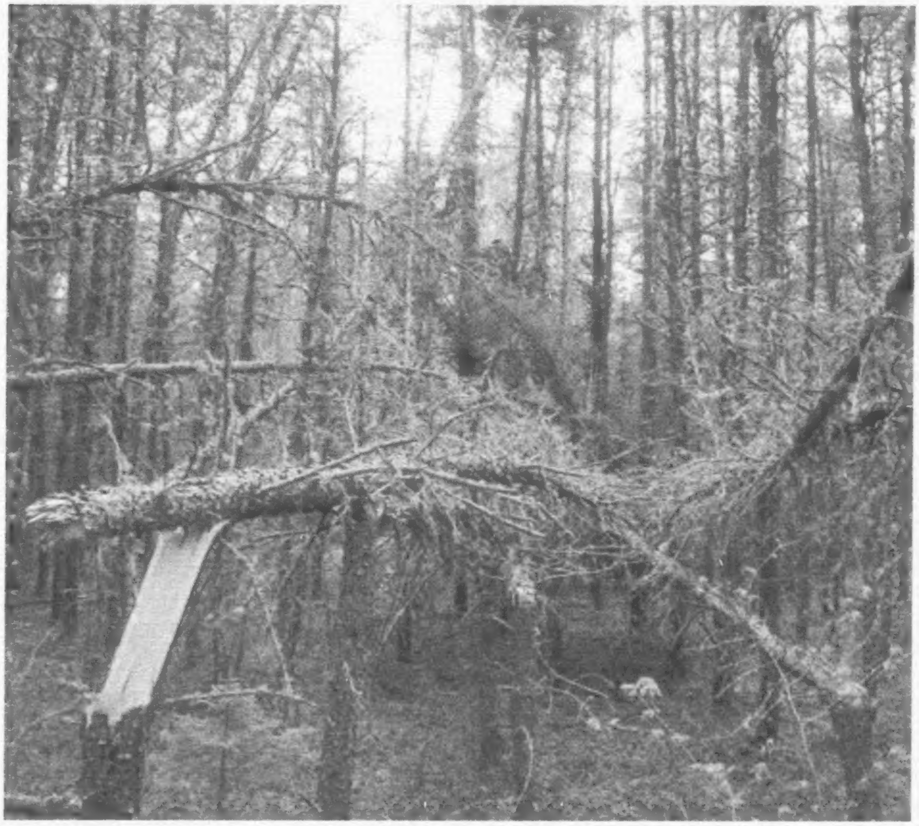


Figure 4.22 Young jack pine trees snapped due to heavy snow loading (photo by S. Young).

Northeast Region

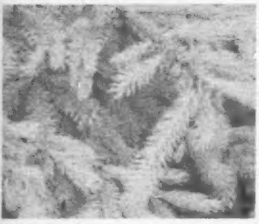
COCHRANE
Northeast Region
HEARST
WAWA
CHAPLEAU
TIMMINS
KIRKLAND LAKE
SAULT STE. MARIE
SUDBURY
NORTH BAY

W. Byman[1], M. Francis[1], and C. Widdifield[1]

[1] *Ontario Ministry of Natural Resources, Science and Information Branch, Inventory, Monitoring and Assessment Section, Sault Ste. Marie*

SECTION

5



FOREST INSECTS

Alder flea beetle, *Altica ambiens* LeC.

Alder flea beetle larvae and adults caused defoliation on speckled alder along Hwy. 17, east of Sturgeon Falls, North Bay District, leaving foliage brown and lace-like in appearance in Northeast Region. Damage was severe with 80-90% of foliage affected.

Pinkstriped oakworm, *Anisota virginiensis* (Drury)

The preferred hosts of pinkstriped oakworm are oak and birch (Figure 5.1). Pink striped oakworm can cause whole-tree mortality if there are consecutive years of severe defoliation. In 2011 low levels of pinkstriped oakworm were recorded in early August on young red oak in Kirkwood Township near McCreight's pond, Sault Ste. Marie District.

Low levels of redhumped oakworm (*Symmerista canicosta* Franc.) were also found feeding with pink striped oakworm on red oak in this same area. Overall combined defoliation by both oakworms was at trace levels.

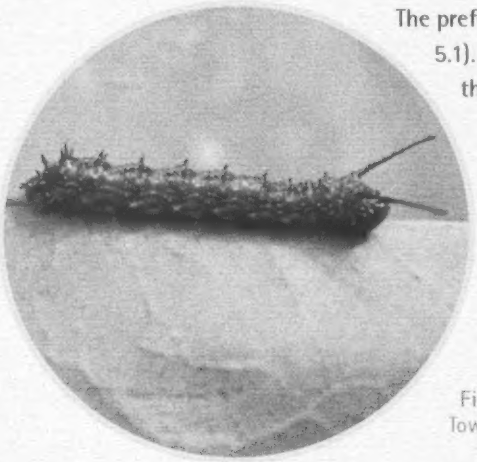


Figure 5.1 Pinkstriped oakworm feeding on red oak, Kirkwood Township, Sault Ste. Marie District (photo by M. Francis).

Cedar leafminer complex
Cedar leafminer, *Argyresthia aureoargentella* (Pack.)
Arborvitae leafminer, *Argyresthia thuiella* Brower

Moderate-to-severe defoliation caused by this cedar leafminer complex was detected on eastern white cedar in North Bay District in 2011. Affected trees were observed throughout a stand on the north shore of Red Cedar Lake running northeast to Mann Lake, and within a stand on the largest island on Wasaksina Lake, McCallum, Sisk, Torrington and Olive townships

Secondary pests contributing to the defoliation on cedar in the area included spruce spider mite (*Oligonychus ununguis* (Jac.)), and false spider mite (*Pentamerismus* spp.).

Large aspen tortrix, *Choristoneura conflictana* (Wlk.)

Several leaf rollers and tiers feed on trembling aspen throughout Ontario's Northeast Region. An individual tree or stand containing one or more of these insect species may result in severe defoliation. This commonly occurs in sporadic, isolated events with the exception of large aspen tortrix which has often caused widespread defoliation. Fortunately, parasites, predators, and disease organisms usually limit outbreaks to 2 to 3 years in a given location. Large aspen tortrix defoliation typically doesn't cause long-term health effects on trembling aspen, but it can reduce tree vigour and predispose trees to attacks from other pests or the effects of drought.

The most recent outbreak of large aspen tortrix in the region peaked in 2009 when 88,743 hectares (ha) of moderate-to-severe defoliation were recorded. The total area of defoliation by large aspen tortrix has continued to decline since 2009 with 12,595 ha aerially mapped in 2011. However, new populations appeared in 2011 in Chapleau, Timmins, and Wawa districts (Table 5.1).

Table 5.1 Area of moderate-to-severe defoliation caused by large aspen tortrix in Northeast Region.

Region	Area of Defoliation (ha)				
District	2007	2008	2009	2010	2011
Northeast					
Chapleau	0	0	7,326	1,265	3,766
North Bay	0	10,606	1,032	0	0
Sault Ste. Marie	0	11075	34,293	4,483	31
Sudbury	0	0	46,092	9,845	5,498
Timmins	0	0	0	0	3,037
Wawa	0	0	0	0	263
Total	0	21,681	88,743	15,593	12,595

Defoliation by large aspen tortrix has declined for the second consecutive year in Sudbury District. In 2010, large aspen tortrix caused 9,845 ha of moderate-to-severe defoliation to trembling aspen. This compares to 5,498 ha of moderate-to-severe defoliation recorded in 2011. The largest area of defoliation occurred south of Massey along the Spanish River and North of Worthington between Fairbank and Ministic lakes in Trill Township. Scattered patches of defoliation were also recorded around the community of Dowling, south of the former Burwash town site, and on Manitoulin Island near the communities of Elizabeth Bay, Poplar, Maple Point, Kagawong, and M'Chigeeng (Figure 5.2).

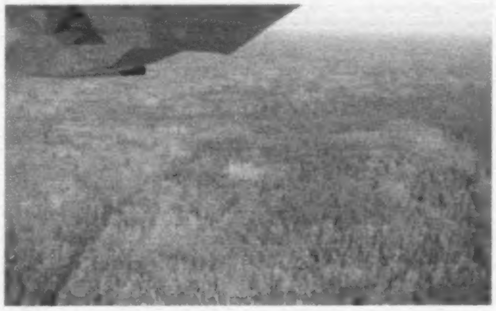
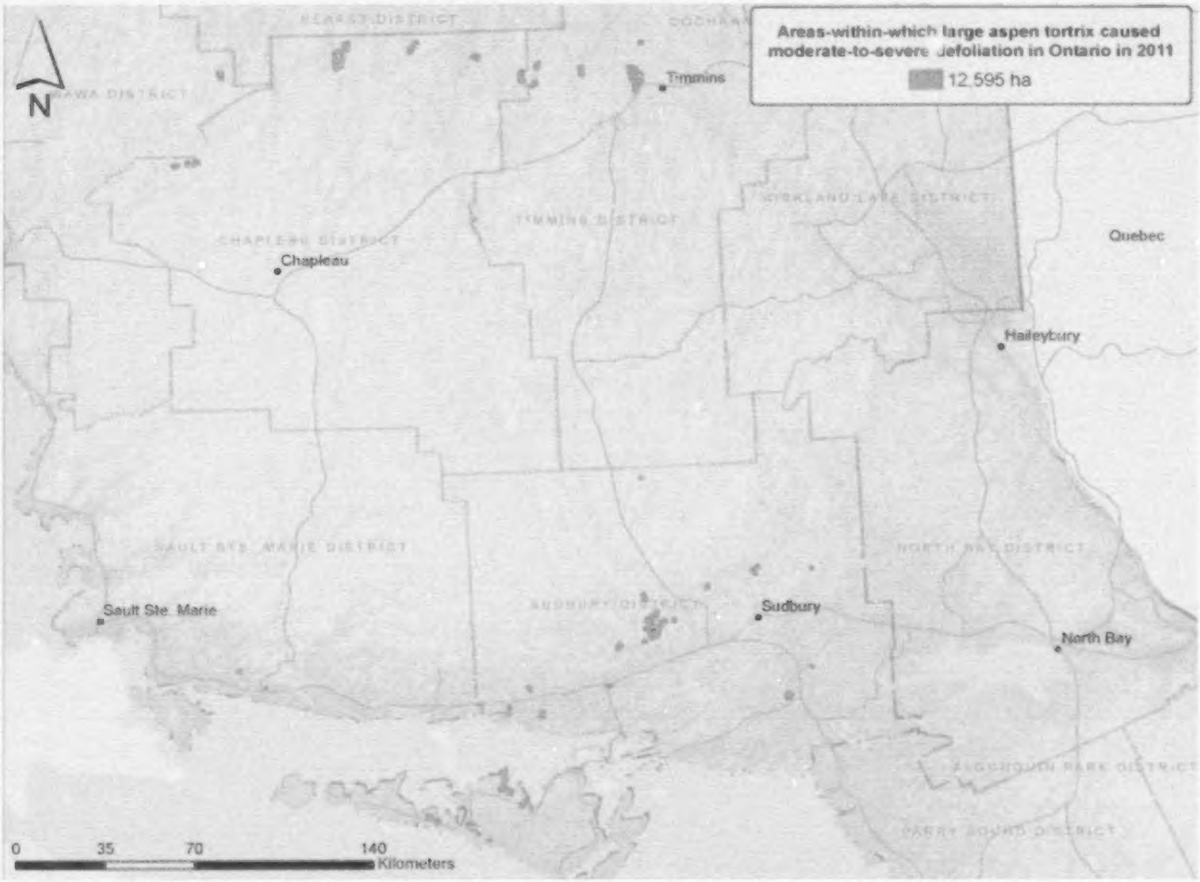


Figure 5.2 Severe defoliation caused by large aspen tortrix (photo by M. Francis).

A population of large aspen tortrix has re-emerged in Chapleau District. A total of 3,892 ha of moderate-to-severe defoliation was mapped with populations concentrated on the north side of the district, bordering Hearst District (Figure 5.3). The two largest pockets were northwest of Kapuskasing Lake along Dunrankin River in Stefansson and Amundsen townships. Smaller pockets were scattered in eastern Wadworth Township, east of Kapuskasing River in Davin Township, along Ivanhoe River in Belford Township, and along the Chapleau and Timmins border in Strachan Township. A few small stands were



Areas-within-which large aspen tortrix caused moderate-to-severe defoliation in Ontario in 2011
▨ 12,595 ha
N
HEARST DISTRICT
COCHRANE
WAWA DISTRICT
Timmins
CHAPLEAU DISTRICT
Chapleau
TIMMINS DISTRICT
KIRKLAND LAKE DISTRICT
Quebec
Haileybury
SAULT STE. MARIE DISTRICT
Sault Ste. Marie
SUDBURY DISTRICT
Sudbury
NORTH BAY DISTRICT
North Bay
ALGONQUIN PARK DISTRICT
PARRY SOUND DISTRICT
0
35
70
140
Kilometers

Figure 5.3 Areas-within-which large aspen tortrix caused moderate-to-severe defoliation in Ontario in 2011.

also defoliated on South Bay of the Missinaibi River in Lang Township and eastern Marsh Township on the border of Wawa District.

Thin crowns of trembling aspen were visible in northern Timmins District where 3,298 ha of defoliation were mapped. The largest area of moderate-to-severe defoliation was on the northeast end of the city of Timmins along the Mattagami River. Scattered pockets of defoliation were also noted in Flying Post Reserve and in Enid, Fortune and Cote townships. A small area was also aerially mapped north of the city of Timmins in Kidd Township.

Trembling aspen in Wawa District also experienced moderate-to-severe defoliation for the first time in recent years with 263 ha recorded in southwest Nebotik Township.

The population present in southeast Sault Ste. Marie District in 2009 and 2010 collapsed in 2011. The total area of moderate-to-severe defoliation peaked in 2009 at just over 34,000 ha, dropped to 4,500 ha in 2010, and in 2011 declined to 31 ha of moderate-to-severe defoliation. There were two pockets of moderate-to-severe defoliation in 2011. The larger area was in Rose Township, between Rose Lake and Bruce Mines, and the smaller pocket was located between Thessalon and Little Rapids, Thessalon Township. Most of this defoliation was on young trembling aspen.

Moderate levels of large aspen tortrix were also found on small groups of trembling aspen trees (<10 trees) between Sault Ste. Marie and Echo Bay along Hwy. 17 and along Hwy. 129 between Wharncliffe and Thessalon. These areas were not visible during aerial surveys.

Light defoliation by large aspen tortrix was also noted in trembling aspen between the city of North Bay and the town of Callander, North Bay District.

Greenstriped mapleworm, *Dryocampa rubicunda* (F.)

Greenstriped mapleworm's preferred hosts are red maple and sugar maple in Ontario (Figure 5.4). In some instances three consecutive years of severe defoliation can predispose the tree to other forest pests, potentially causing mortality.

In Northeast Region this defoliator was observed on red maple in Sault Ste. Marie, North Bay and Timmins districts. For the third consecutive year greenstriped mapleworm was detected in the central portion of Kirkwood Township, Sault Ste. Marie District. The infestation has grown in size, but is still limited to Kirkwood Township along the west side of Hwy. 129. The level of defoliation has also increased from moderate defoliation on understory red maple in 2009 and 2010 to severe defoliation on understory and mature red maple in 2011.

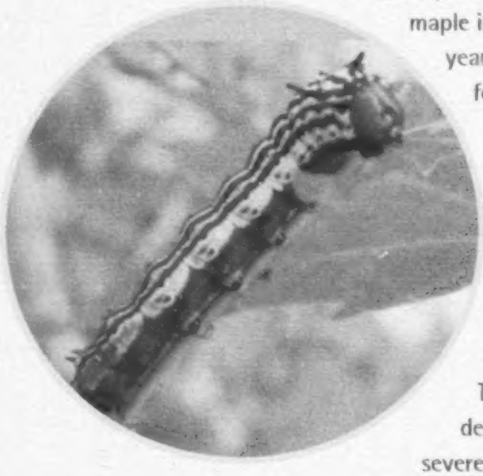


Figure 5.4 Greenstriped mapleworm feeding on understory red maple, Kirkwood Township, Sault Ste. Marie District (photo by M. Francis).

Greenstriped mapleworm was recorded feeding northeast of Temagami Lake, North Bay District where defoliation reached moderate-to-severe levels on young red maple up to 10 m in height.

In Westbrook Township, Timmins District, greenstriped mapleworm larvae were recorded feeding on understory red maple in a jack pine stand. Less than 10% of the red maple trees were affected, but defoliation in the crowns of these trees was recorded at 75%. This is the furthest north greenstriped mapleworm has ever been recorded in Ontario.

Aspen twoleaf tier, *Enargia decolor* (Wlk.)

Periodic outbreaks of aspen twoleaf tier have occurred in Northeast Region in the past. Often this leaf tier (Figure 5.5) is found together with large aspen tortrix (*Choristoneura conflictana* (Wlk.)) which normally outcompetes aspen twoleaf tier. Outbreaks are normally short lived as a large number of parasites cause the collapse of the infestation. The last major outbreak of aspen twoleaf tier in Northeast Region was in 1997 when over 675,000 ha of moderate-to-severe defoliation on poplar was mapped in Hearst and Wawa districts, Northeast Region. In 2011, moderate-to-severe defoliation was aerially mapped in Sault Ste. Marie and Chapleau districts, Northeast Region consisting of 1,482 ha (Figure 5.6).

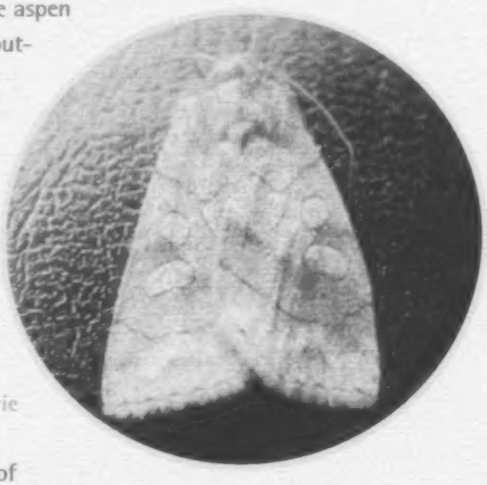


Figure 5.5 Adult aspen two leaftier at rest, Sault Ste. Marie District (photo by M. Francis).

Aspen twoleaf tier caused moderate-to-severe defoliation of trembling aspen along the Hwy. 129 corridor beginning north of Aubrey Falls in Martel Township, Sault Ste. Marie District extending north to White Rat Lake in the southwest corner of Birch Township, Chapleau District. The most severe defoliation was seen just south of Flame Lake in the southeast portion of Deans Township, Chapleau District and stretched into the central portion of Gaunt Township, Sault Ste. Marie District.

Smaller pockets of moderate-to-severe defoliation were observed west of the above area on the eastern side of Ferrier Township and the southeast portion of McNie Township east of the Aubinadong River, both townships in Sault Ste. Marie District.

Younger trembling aspen north and south of these areas had sporadic light defoliation by aspen twoleaf tier suggesting a larger area of damage may occur in 2012.

Oak trumpet skeletonizer, *Epinotia timidella* (Clem.)

Oak trumpet skeletonizer forms a slender tube made of excrement and silk where it lives when not feeding on foliage (Figure 5.7). This pest has never caused serious problems, but is unsightly.

Low levels of this skeletonizer were seen in the southwest portion of Sault Ste. Marie

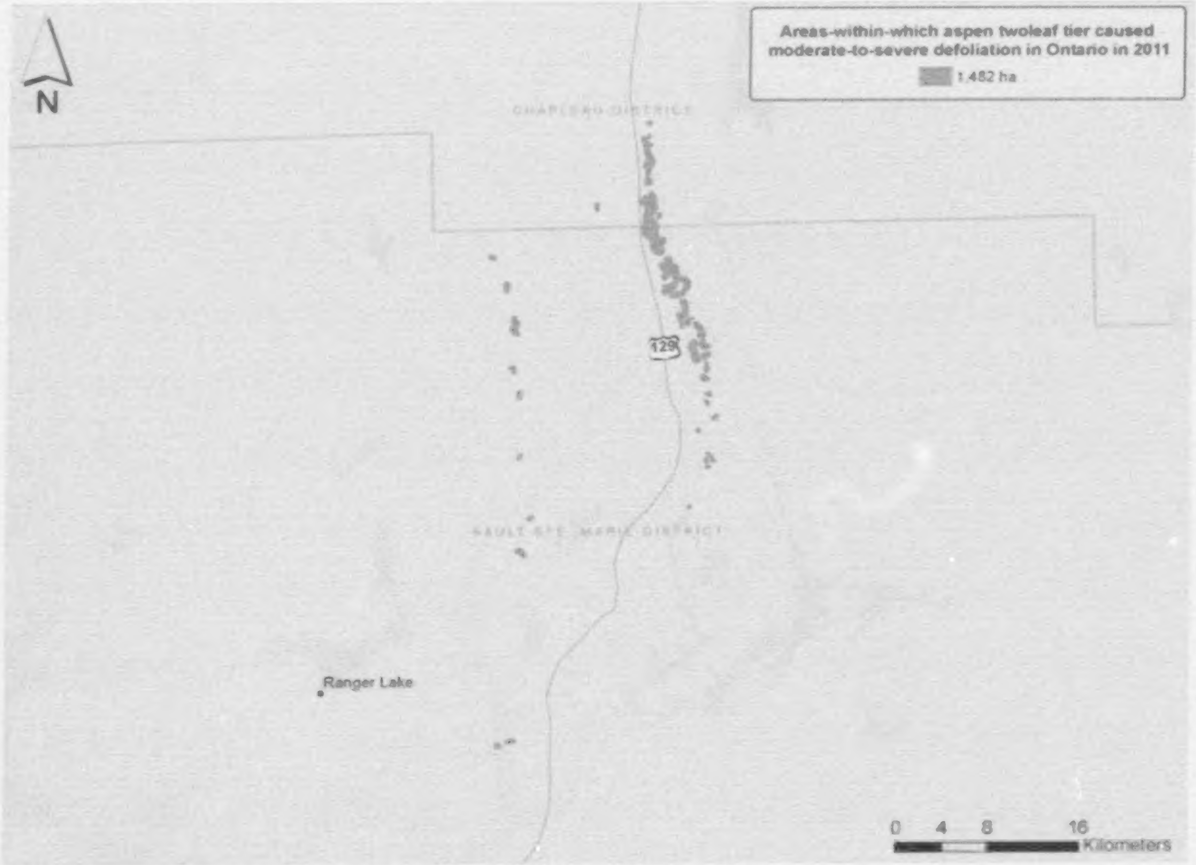

Areas-within-which aspen twoleaf tier caused moderate-to-severe defoliation in Ontario in 2011
▨ 1,482 ha
N
CHAPLEAU DISTRICT
129
SAULT STE. MARIE DISTRICT
Ranger Lake
0 4 8 16
Kilometers

Figure 5.6 Areas-within-which aspen twoleaf tier caused moderate-to-severe defoliation in Ontario in 2011.

District in 2011. Defoliation was minimal in most cases except in the northwest area of the city of Sault Ste. Marie where light defoliation was recorded at the Pointe des Chenes area. At the OMNR arboretum on Third Line, 20% defoliation occurred in a young red oak plantation with trees along the edge more heavily defoliated than those in the interior of the plantation. In all cases defoliation occurred on red oak in the lower portion of the tree's crown.

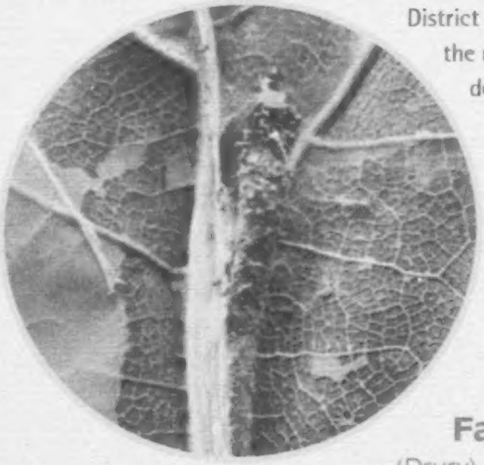


Figure 5.7 Oak trumpet skeletonizer feeding tube and larva, Sault Ste. Marie District (photo by M. Francis).

Fall webworm, *Hyphantria cunea* (Drury)

Fall webworm is a native insect whose diet includes a wide variety of deciduous trees and shrubs. The hairy larvae feed within webbed tents which cover the ends of the branches like a shroud (Figure 5.8). The tents are sometimes mistaken for eastern tent caterpillar (*Malacosoma americanum* (F.)) which forms its tents in the crotches of branches.

The fall webworm population in Northeast Region has been minimal in recent years with feeding limited to individual trees. In 2011, the conspicuous webs and light defoliation were found on individual branches of black ash, white birch and cherry scattered throughout the city of North Bay and surrounding area in North Bay District.

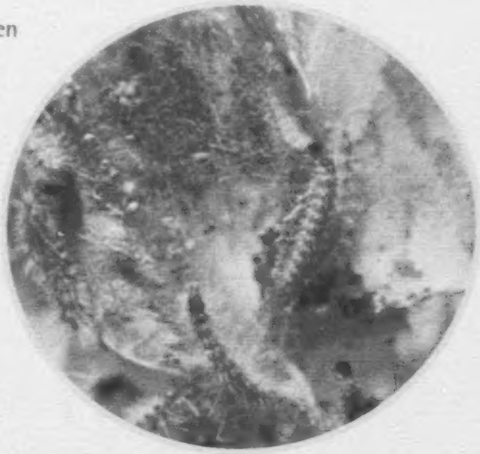
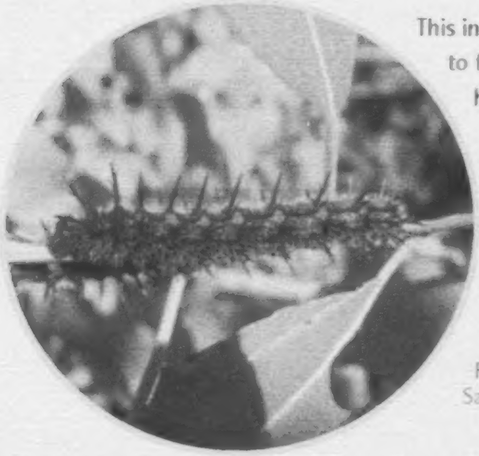


Figure 5.8 Fall webworm larvae feeding within webbing on a white birch, Sudbury District (photo by W. Byman).

Spiny elm caterpillar, *Nymphalis antiopa* (L.)



This insect is usually of minor importance to forests, but can be a pest on individual trees for homeowners.

In Sault Ste. Marie District spiny elm caterpillar defoliated a small area of young understory willow along Black Creek Road on the west side of Winkler Township. Only 3-4 trees were affected, but defoliation was severe. The trees were less than 3 m tall.

Figure 5.9 Spiny elm caterpillar feeding on willow, Sault Ste. Marie District (photo by M. Francis).

Balsam poplar leafblotch miner, *Phyllonorycter nipigon* (Free.)

In 2009 and 2010, balsam leafblotch miner defoliation was recorded in balsam poplar stands throughout the Northeast Region. However, in 2011 this insect was only recorded in North Bay and Kirkland Lake districts.

Similar to aspen leafblotch miner (*Phyllonorycter ontario* (Free.)), larvae of balsam poplar leafblotch miner begin mining leaves in late spring, making small oval patterns, which turn brown as the summer progresses (Figure 5.10). After pupation in August, adult beetles continue to feed, creating patchy holes through the leaves. Balsam poplar leafblotch miner typically affects young trees, unless outbreaks are heavy. In 2011 damage was found from late July to September in balsam poplar stands throughout both North Bay and Kirkland Lake districts on young and mature trees.

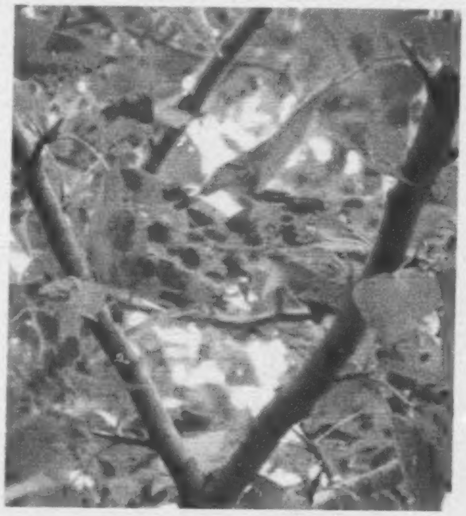


Figure 5.10 Brown blisters resulting from balsalm poplar leafbloth miner, North Bay District (photo by C. Widdifield).

In Kirkland Lake District, damage was found along Hwy. 624 corridor, Evanturel Township, and near Pothole Lakes in Garrison and Thackeray townships.

In North Bay District damage was visible west of Montreal River in Lorrain and South Lorrain townships, northeast of the city of North Bay, along Hwy. 17 in Pedley Township, and near McLaren's Bay, Parkman Township.

Aspen leafblotch miner, *Phyllonorycter ontario* (Free.)

In 2011 aspen leafblotch miner (Figure 5.11) continued to infest scattered pockets within trembling aspen stands that were attacked in previous years in Kirkland Lake and North Bay districts. Damage was observed to a much lesser extent on large tooth aspen.

Moderate-to-severe defoliation was recorded in young trembling aspen stands in Finlayson Provincial Park and east of the town of Latchford in North Bay District. In Kirkland Lake District the insect fed on young trembling aspen just north of Englehart along Hwy. 624.

Although aspen leafblotch miner prefers the foliage of young trembling aspen, all ages suffered moderate-to-severe defoliation with 60-80% of foliage affected along Hwy. 63 within Parkman and South Lorraine townships, North Bay District. Aspen of various ages had moderate-to-severe damage near Pothole Lakes in Garrison Township, Kirkland Lake District.

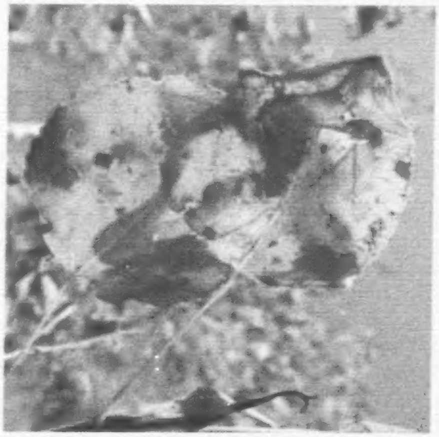


Figure 5.11 Brown foliage on trembling aspen caused by aspen leafblotch miner, North Bay District (photo by C. Widdifield).

Redhumped oakworm, *Symmerista canicosta* Franc.

Redhumped oakworm infestations are generally short-lived, due to parasitoids, diseases and predators such as birds. Impacts by this late-season defoliator are minimal, but if preceded by an early season defoliator, affected trees may lose vigour and be more susceptible to other forest pests.

The redhumped oakworm (Figure 5.12) is often confused with the orangehumped mapleworm (*Symmerista leucitys* Franc.). The orangehumped mapleworm (Figure 5.14) has three black lateral lines on the middle of its back while the redhumped oakworm has five.

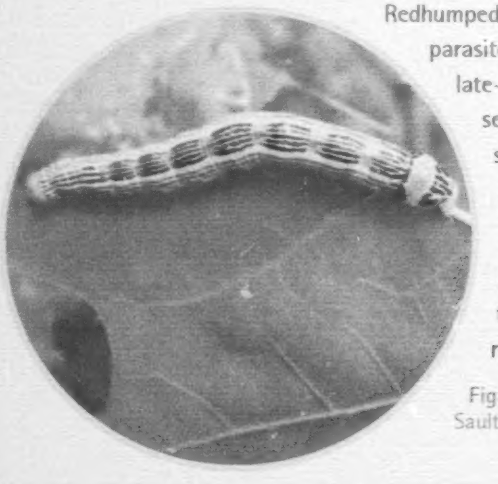


Figure 5.12 Redhumped oakworm larva on understory red oak, Sault Ste. Marie District (photo by M. Francis).

In North Bay District a small infestation of oakworm has caused light-to-moderate defoliation in a stand of red oak in Beaucage Township, North Bay District since 2009. In 2011, moderate defoliation was recorded on the stand's edge with light defoliation recorded on the understory trees in the interior.

During an extension call in the Pointe des Chenes area, Sault Ste. Marie District, light redhumped oakworm defoliation was recorded on two mature red oak trees. A small understory red oak had 60% defoliation. Low levels of this oak defoliator were also found in Kirkwood Township causing trace defoliation on young red oak.

Orangehumped mapleworm, *Symmerista leucitys* Franc.

Orangehumped mapleworm was found in the southern portion of Sault Ste. Marie District in 2011 (Figure 5.13). This insect was commonly found from Sault Ste. Marie to Blind River, but defoliation was minimal. The most overall stand defoliation was recorded at light levels on sugar maple at the south end of St. Joseph Island along Baseline Road, Garside Road and Richmond Bay Road. This late-season defoliator was also recorded on young understory American beech at Richmond Bay Road, causing 90% defoliation on four trees less than two metres in height.

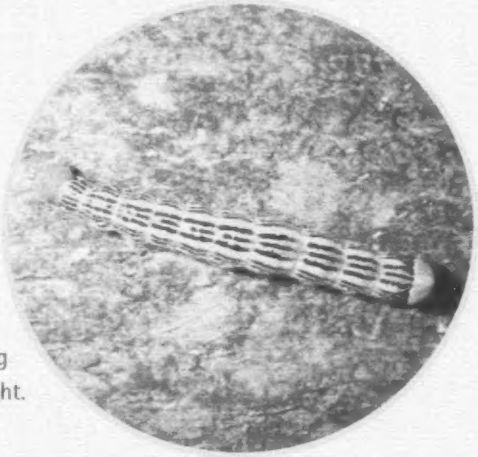


Figure 5.13 Orangehumped mapleworm on an American beech tree, Sault Ste. Marie District (photo by M. Francis).

FOREST ABIOTIC EVENTS

White pine browning

In late summer to early fall of 2009 widespread browning of eastern white pine occurred in Ontario, Quebec and New Brunswick. This event was followed up by a detection survey to identify the casual agent in both 2010 and 2011.

The needle browning has variously been referred to as Dook's needle blight, semi-mature tissue needle blight, and ozone damage.

In many cases the spores of Dook's needle blight (*Lophophacidium dooksii* Corlett & Shoemaker) have been identified on infected needles. However, diagnosis of the disease is difficult. It is not known whether Dook's needle blight is a primary cause of the symptoms of needle browning observed on white pine trees in Ontario. The first report of Dook's needle blight was made in Ontario, with the first collection being made in 1979 near McCreight's Dam, north of Thessalon, Sault Ste. Marie District. Periodic reports of this disease have occurred since that time.

It's possible the cause of the needle browning is indeed Dook's needle blight, but the lack of fruiting bodies detected on affected eastern white pine needles in recent years makes it difficult to make a firm diagnosis. Because white pine browning events have been sporadic, there has been limited research into Dook's needle blight or white pine browning. The latest event of white pine browning has renewed investigation into this disease.

In 2011 over 50% of the trees in an eastern white pine hybrid plantation became infected by Dook's needle blight at the OMNR arboretum in the city of Sault Ste. Marie, Sault Ste. Marie District. Infection rates varied in the plantation from a few shoots lightly infected on some trees to all shoots severely infected. In early September heavily infected trees appeared brown in colour. Closer inspection revealed that a small portion at the base of the needle remained green.

For the past two years four individual pine trees at the OMNR arboretum have been monitored for Dook's needle blight. Three of the four trees were Macedonian pines which were severely affected by this blight. The fourth tree was a hybrid of western white pine and Japanese white pine which was not infected (Figure 5.14).

Preliminary investigations at the arboretum have shown that Macedonian pine or trees crossbred with this species are more vulnerable to severe infection by the blight. Infection rates varied in the plantation from a few shoots lightly infected to all shoots severely infected.

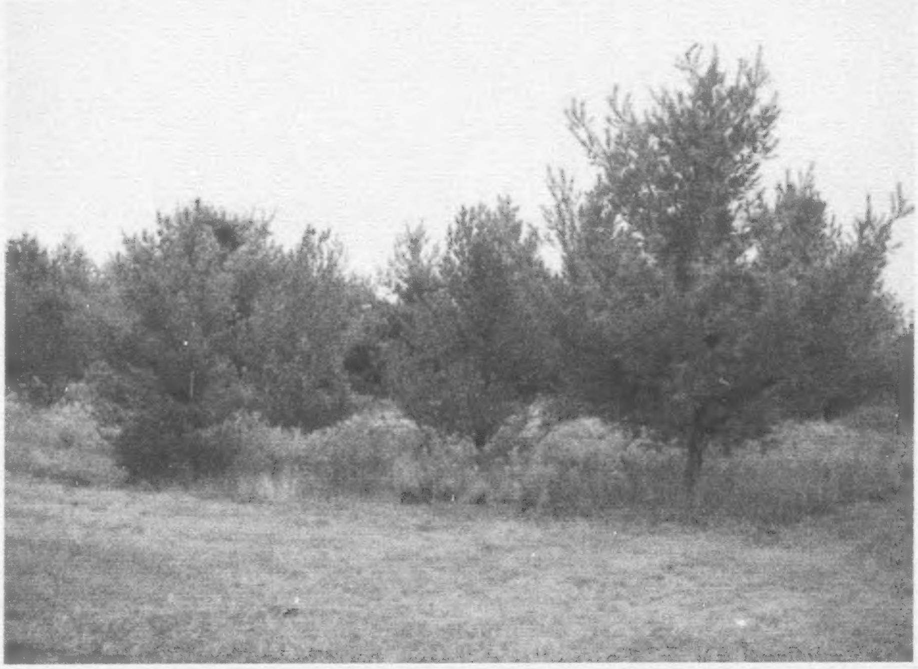
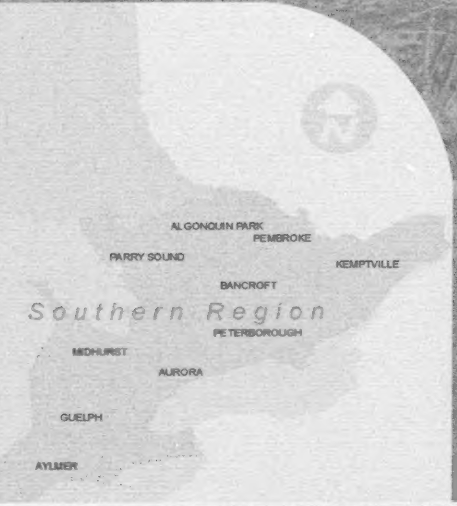


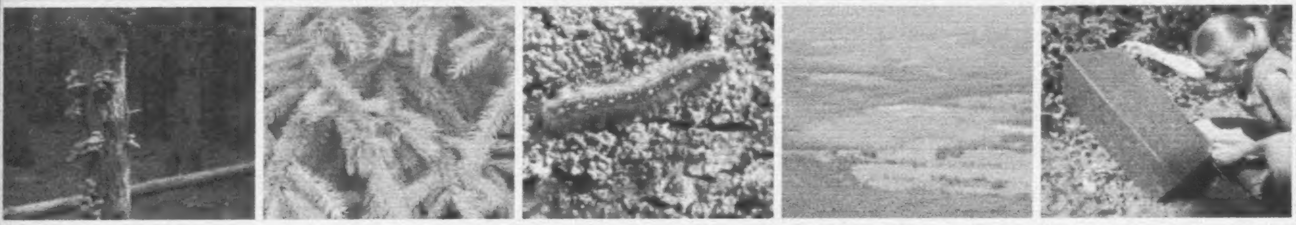
Figure 5.14 The four white pine trees monitored for dook's needle blight. The three infected pine species being Macedonian pine and the fourth a hybrid of Japanese and western white pine in Sault Ste. Marie District (photo by M. Francis).

Southern Region

P. Hodge[1], W. Byman[1], R. Lidster[1],
S. McGowan[1], and A. Zeppa[1]

[1] *Ontario Ministry of Natural Resources, Science and Information Branch, Inventory, Monitoring and Assessment Section, Sault Ste. Marie*





FOREST INSECTS

Erineum mite, *Acalitus fagerinea* (Keifer)

Galls induced by erineum mite populations are often seen as a felt-like material on the underside of infested foliage (Figure 6.1). These galls have little impact on tree health however high populations can cause stress to host trees.

Acalitus erineum mite caused light levels of defoliation to approximately 90% of American beech saplings growing in the understory of a 25 hectare (ha) stand of sugar maple and oak in the Ganaraska Forest East, Peterborough District. To a lesser extent erineum mites caused trace levels of defoliation to American beech in woodlands east of Hwy. 35 and south of County Road 12, Bancroft District. These mites also occurred at trace levels on understory American beech in Charleston Lake Provincial Park, Leeds and Grenville County, Kemptville District.

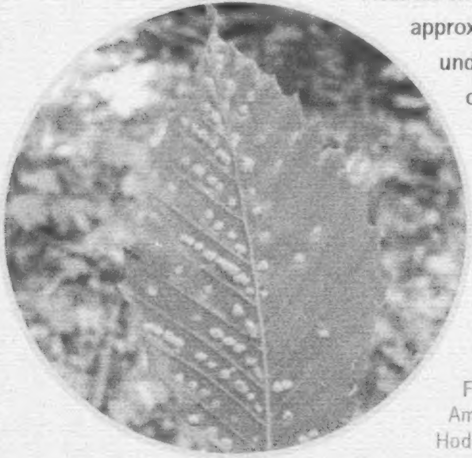
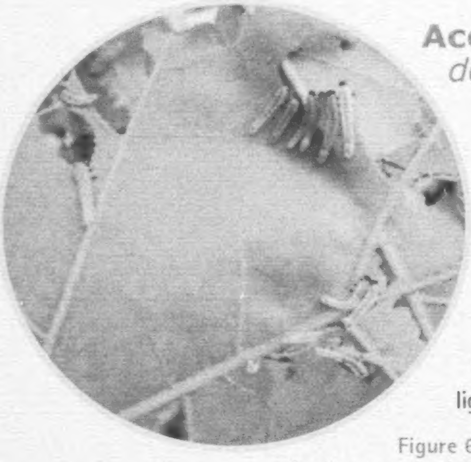


Figure 6.1 Galls induced by erineum mites on the underside of American beech foliage, Peterborough District in 2011 (photo by P. Hodge).

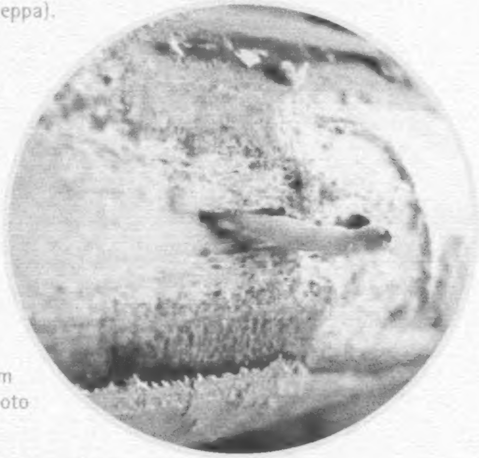


Acordulecera sawfly, *Acordulecera dorsalis* Say

This common sawfly feeds gregariously on red oak (Figure 6.2). It is seldom found causing significant defoliation in Ontario. In 2011, moderate-to-severe defoliation was recorded on red oak along Hunt Club Road, Ottawa, Kemptville District. Hickory leaf roller (*Pseudexentera cressoniana* (Clem.)) caused additional defoliation on the same host trees in the same area. It exhibited the characteristic feeding habit of rolled leaves and caused light levels of defoliation.

Figure 6.2 Acordulecera sawfly larvae feeding on red oak foliage (photo by A. Zeppa).

Bronze birch borer, *Agrilus anxius* Gory



This wood boring insect is considered to be one of the most destructive pests of birch in Ontario. Larvae feed within the phloem of the tree creating meandering tunnels just under the bark effectively girdling the tree (Figure 6.3).

Figure 6.3 Bronze birch borer larva exposed from a feeding gallery under the bark of white birch (photo by A. Zeppa).

In recent years, bronze birch borer has been detected causing moderate decline to birch stands. In 2011, additional decline at moderate levels were recorded in a stand of white birch on Hwy. 416 at exit 40 County Road 19, Leeds and Grenville County, Kemptville District.

Fall cankerworm, *Alsophila pometaria* (Harr.)

Fall cankerworm is a native species of looper in Ontario that defoliates a wide variety of deciduous trees and shrubs in both urban and forested lands. Consecutive years of defoliation can lead to twig and branch mortality and can contribute to a general loss in tree vigour.

Detectable populations in Southern Region have existed in the former Houghton Township, Norfolk County, Aylmer District for the past three consecutive years causing occasional severe defoliation.

In 2011, these populations seem to have collapsed as defoliation was reduced to 172 ha of light defoliation compared to 1,937 ha of moderate-to-severe defoliation recorded in 2010 (Figure 6.4).

Defoliated woodlots included those owned by Long Point Region Conservation Authority as well as privately owned individual woodlots. Preferred hosts included white oak,red maple,

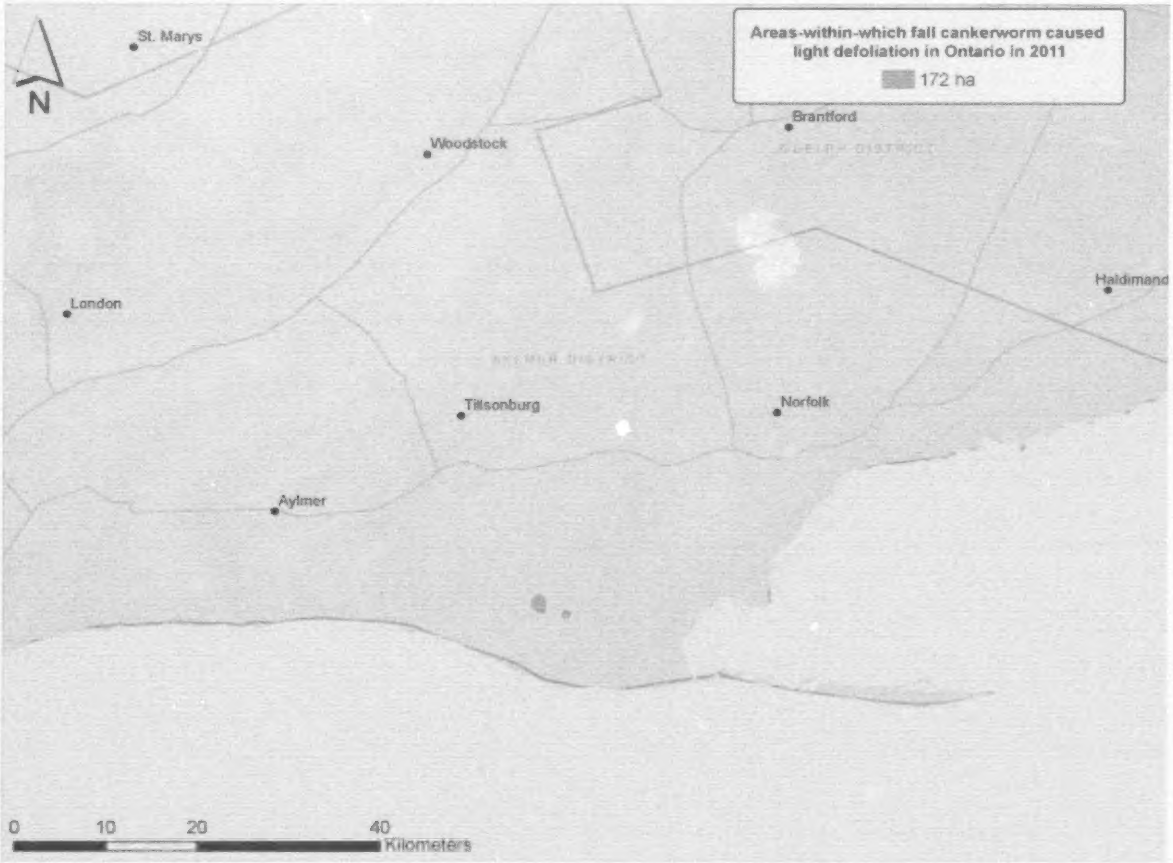

Areas-within-which fall cankerworm caused light defoliation in Ontario in 2011
▨ 172 ha
N
St. Marys
Woodstock
Brantford
GUELPH DISTRICT
London
Haldimand
AYLMER DISTRICT
Tillsonburg
Norfolk
Aylmer
0
10
20
40
Kilometers

Figure 6.4 Areas-within-which fall cankerworm caused light defoliation in Ontario in 2011.

silver maple, sugar maple, American beech, white elm, and basswood, with other hardwood tree and shrub species defoliated to a lesser extent.

Birch sawfly, *Arge pectoralis* (Leach)

This important pest of birch occurs throughout Ontario and is capable of sporadic outbreaks where localized infestations may cause significant defoliation (Figure 6.5).

In Southern Region, this pest was collected in Midhurst and Aurora districts causing moderate levels of defoliation. Birch sawfly populations in 2011 caused approximately 40% defoliation to young roadside and ornamental white birch, particularly along Lake Huron in the Port Elgin area, Midhurst District. Many satellite pockets were also identified at moderate levels in York and Durham regions, Aurora District.

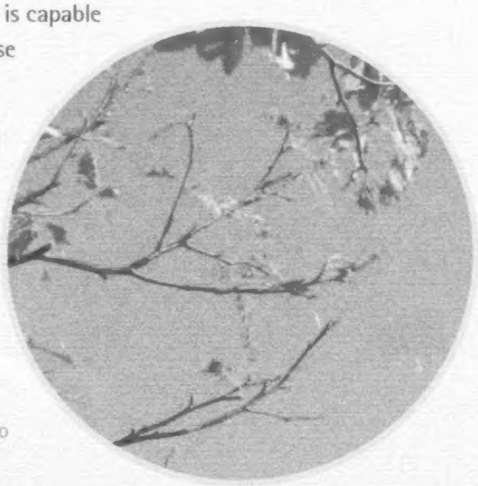


Figure 6.5 Birch sawfly larva feeding on white birch (photo by S. McGowan).

Basswood leafminer, *Baliosus nervosus* (Panz.)

Basswood leafminer is a native insect that feeds on and mines the foliage of basswood. In Ontario, feeding damage can reach moderate-to-severe levels, occasionally causing branch dieback and a decrease in tree vigour. If heavy infestations occur over consecutive years, coinciding with drought or other stresses, possible crown dieback and mortality may occur.

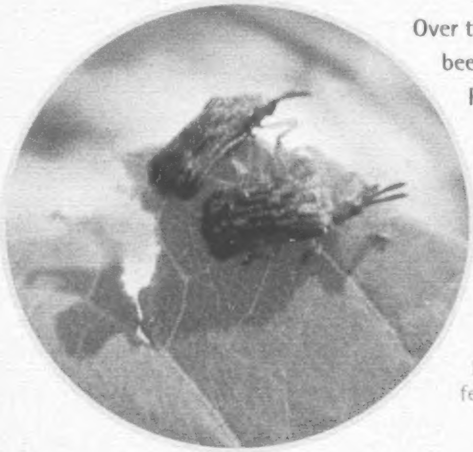


Figure 6.6 Adult basswood leaf miners performing maturation feeding in Midhurst District (photo by P. Hodge).

Over the past five years in Southern Region, small infestations have been detected in Aurora, Midhurst, Aylmer and Guelph districts. From 2006 to 2010, populations of basswood leafminer were identified in the same concentrated areas of Aurora and Midhurst districts. However in 2011, defoliation was not observed at these locations.

In 2011, light levels of defoliation were detected in Spirit Rock Conservation Area, Grey Sauble Conservation Authority, centrally situated in Bruce County (Figure 6.6).

Cedar leafminer complex:
Brown cedar leafminer, *Coleotechnites thujaella* (Kft.)
Cedar leafminer, *Argyresthia aureoargentella* Brower
Cedar leafminer, *Argyresthia canadensis* Free
Arborvitae leafminer, *Argyresthia thuiella* (Pack.)

Cedar leafminer defoliation to eastern white cedar was recorded across Southern Region with the exception of Guelph District, causing 2,822 ha of moderate-to-severe defoliation in 2011 (Figure 6.7). This compares to 4,773 ha of moderate-to-severe defoliation recorded in 2010, a decrease of 40%.

For the first time in 8 years *Argyresthia canadensis* and *A. thuiella* measuring less than 1cm long were recorded within Peterborough and Bancroft Districts as a major forest disturbance causing 1,799 ha of moderate-to-severe defoliation (Figure 6.8). The majority of this occurred in Northumberland County and north into Peterborough County as many scattered satellite pockets were detected south of Rice Lake from Brighton to Port Hope. Eastern white cedar stands were severely defoliated in the Burnley and Oak Heights areas within Trent Hills, consisting of 60-90% defoliation to approximately 120 ha of a cedar stand 8.5 m in height.

Other significant areas of defoliation in Peterborough District occurred just south of Upper Stony Lake, Douro-Dummer Township, consisting of 140 ha of severely affected eastern white cedar and in the north-west of Amherst Island where approximately 130 ha of moderate-to-severe defoliation were recorded to young eastern white cedar approximately 5 m in height. Smaller pockets also occurred in the townships of Otonabee-South Monaghan and Cavan-Monaghan, and west into the City of Kawartha Lakes.

In Midhurst District an aerial survey revealed 622 ha of moderate-to-severe defoliation within Grey, Simcoe and Dufferin counties. These occurred in scattered pockets across Chatsworth,

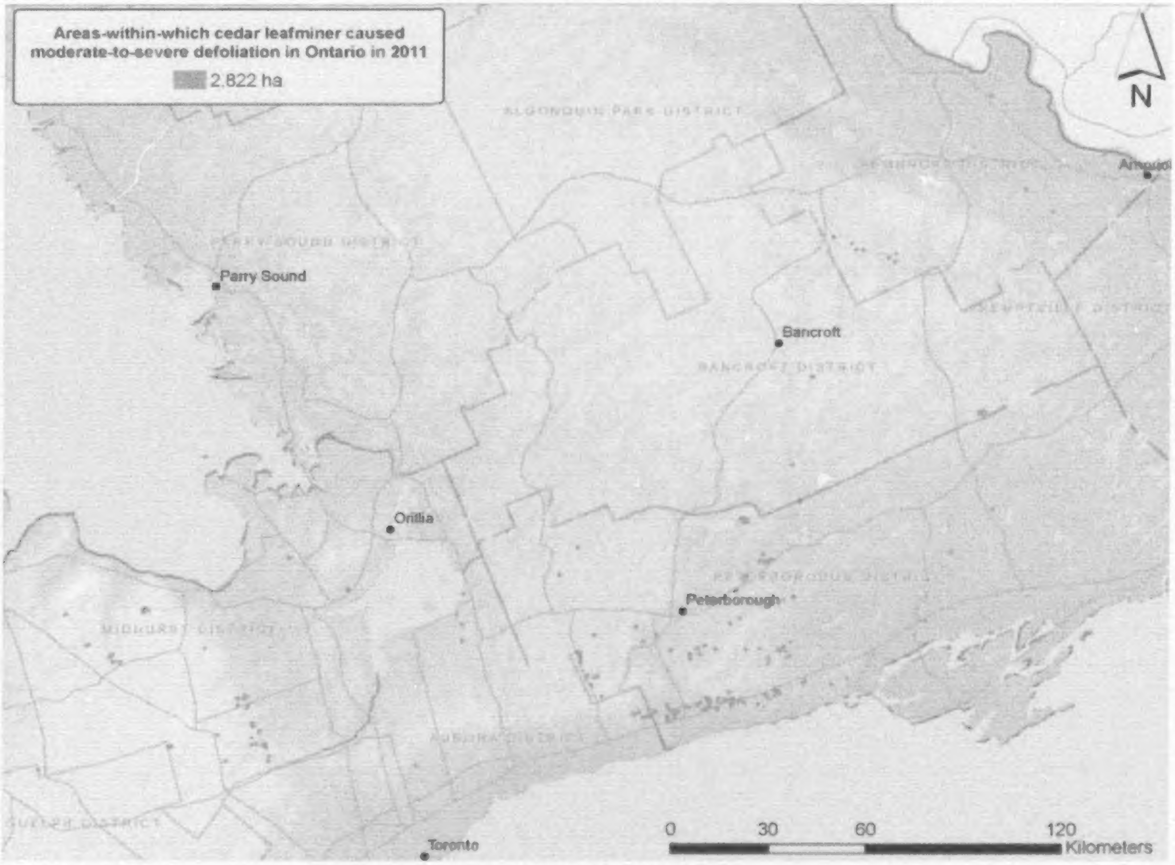

Areas-within-which cedar leafminer caused moderate-to-severe defoliation in Ontario in 2011
▨ 2,822 ha
N
ALGONQUIN PARK DISTRICT
PARRY SOUND DISTRICT
Parry Sound
Bancroft
BANCROFT DISTRICT
Orillia
PETERBOROUGH DISTRICT
Peterborough
MIDHURST DISTRICT
AURORA DISTRICT
GUELPH DISTRICT
Toronto
0
30
60
120
Kilometers

Figure 6.7 Areas-within-which cedar leafminer caused moderate-to-severe defoliation in Ontario in 2011.

West Grey and Grey Highlands and within the Blue Mountains area, Grey County. Cedar leafminer damage was also recorded in Clearview, Oro Medonte, Adjala Tosorontio and Tay townships, Simcoe County and within Mono, Mulmur and Amaranth townships, Dufferin County (Figure 6.9).

Two satellite pockets in Bancroft District were affected, where approximately 208 ha of moderate-to-severe defoliation was recorded west of Big Gull Lake and south of Mitchell's Bay, North Frontenac County and a small pocket south of Tangamong Lake, Hastings County.

In Aurora District, scattered pockets of moderate-to-severe defoliation totalling 90 ha were recorded from Georgina to Brock within the eastern portion of Clarington Township Notable infestations recorded from ground surveys but not aerially mapped were detected within the Regional Municipalities of York and Durham.

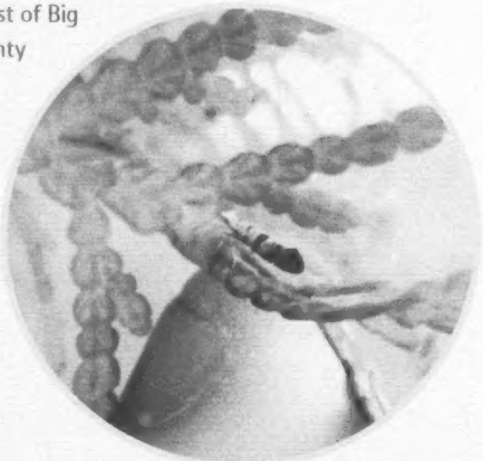


Figure 6.8 Newly emerged cedar leafminer adult moth (photo by A. Zeppa).

Scattered pockets of arborvitae leafminer were observed throughout Pembroke District causing moderate-to-severe damage totalling 80 ha. These occurred within Lyndoch, Raglan and Brudenell townships, with single pockets north of Calabogie Lake, Greater Madawaska Township; east of Renfrew, Horton Township; and along the east shore of Muskrat Lake, Renfrew County.

Trace levels of defoliation were recorded within Mac Johnson Wildlife Area, Cataraqui Region Conservation Authority and Lake Shore road west of Alexandria, Kemptville District. Other observations of cedar leafminer defoliation were made along Orange Hall Road at Shorty's Sideroad near Mabee's Corners in the former Middleton Township, Norfolk County and along Silver Clay Line east of Macpherson Road, in the municipality of West Elgin, Aylmer District.

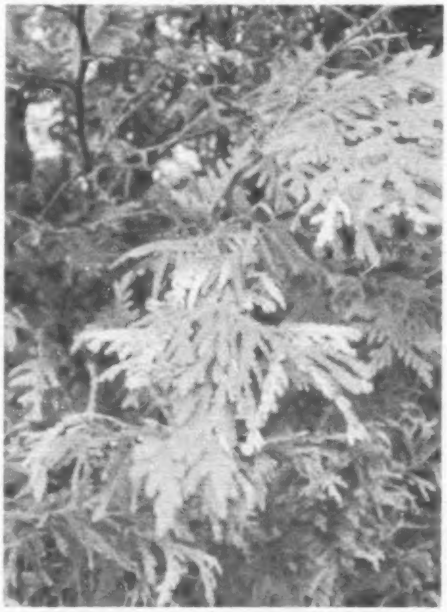
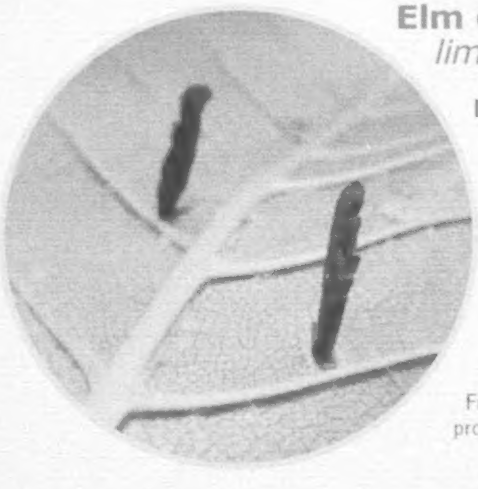


Figure 6.9 Light defoliation on eastern white cedar caused by cedar leafminer (photo by P. Hodge).

Oak leafshredder, *Croesia semipurpurana* (Kft.)

This native oak defoliator can be found across the range of red oak in Ontario. In 2011 oak leafshredder caused moderate-to-severe levels of defoliation identified from ground surveys in Viemede Game Preserve near Big Cedar, Bancroft District. Obliquebanded leafroller (*Choristoneura rosaceana* (Harr.)) was also identified at this site feeding alongside oak leafshredder as a secondary pest. Larvae of both of these insects caused moderate levels of defoliation to approximately 20 ha of bur oak and white oak that was not evident during aerial surveys.

Elm casebearer, *Coleophora limosipennella* (Dup.)



Larvae of this native moth can be seen feeding on all species of elm throughout Ontario (Figure 6.10). This insect was detected in Bancroft, Aylmer and Guelph districts in 2011. Moderate levels of defoliation were recorded on understory white elm in two separate locations along County Road 23, in the former South Walsingham Township and along Charlotteville West ¼ Line just south of County Road #3, North of Forestville, Norfolk County, Aylmer District.

Figure 6.10 Larvae feeding on slippery elm from within its protective case (photo by P. Hodge).

Trace levels of defoliation were found on approximately 10% understory saplings of slippery elm along Bass Lake and White Valley roads, in the township of Gallaway-Cavandish and Harvey, Bancroft District.

Additional defoliation caused by elm casebearer was recorded in Guelph District along Perth Line 10, east of Science Hill, causing light defoliation to understory saplings of white elm.

Cherry casebearer, *Coleophora pruniella* Clem.

This common casebearer of both cherry and birch was reported in Kemptville, Bancroft and Aylmer Districts at trace levels in 2011 (Figure 6.11).

Defoliation was noted on white birch in Charleston Lake Provincial Park, Leeds and the Thousand Islands Township, Kemptville District and along Gold Lake Road, Kawartha Highlands Signature Site Park, North Kawartha Township, Bancroft District. In both Kemptville and Bancroft districts this insect was feeding along with the exotic birch casebearer (*Coleophora serratella* L.).

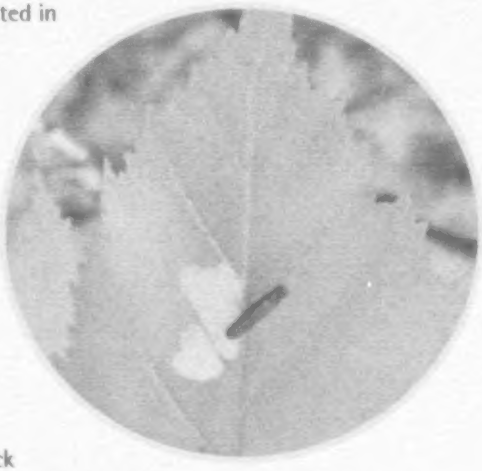


Figure 6.11 Cherry casebearer feeding on white birch, Bancroft District (photo by P. Hodge).

Cherry casebearer was also found on its preferred host, black cherry along Orange Hall Road, and on Concession Road 4, Cultus, Norfolk County, Aylmer District.

All instances contained low populations causing trace level defoliation.

Walnut caterpillar, *Datana integerrima* G. & R.

Walnut caterpillar is native to Ontario and is commonly found on nut trees including black walnut, butternut, and some species of hickory (Figure 6.12).

In Ontario, this pest typically occurs in scattered pockets and on isolated individual trees. If severe defoliation occurs for consecutive years, twig and branch dieback may occur potentially leading to whole-tree mortality if secondary insects or disease a present.

Several isolated infestations were identified in Guelph and Aylmer districts in 2011. A population of late instar larvae was found northwest of Cambridge along Dodge Dr., Region of Waterloo, Guelph District,

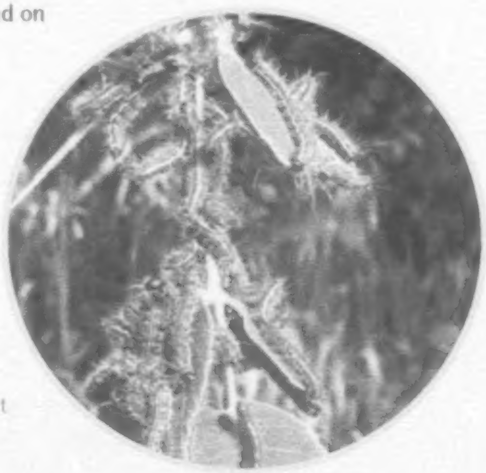


Figure 6.12 Late instar walnut caterpillar larvae feeding gregariously on black walnut near Cambridge, Guelph District (photo by R. Lidster).

feeding gregariously on two mature black walnut trees causing moderate (40%) levels of defoliation. In Springbank Park an early instar colony was found on a single black walnut tree causing light levels of defoliation along the Thames River, Middlesex County, Aylmer District.

Cherry scallopshell moth, *Hydria prunivorata* (Fgn.)

Cherry scallopshell moth is a primary defoliator of cherry in Ontario and was recorded on black cherry in Aylmer and Bancroft districts in 2011 (Figure 6.13). In Southern Region, moderate-to-severe defoliation has been on a steady decline from a high of 224 ha in 2008 to 76 ha in 2010 to a mere 2 ha recorded in 2011.

Defoliation was confined to a single woodlot within the Kinglake Community, Norfolk County representing a 97% decline from 2010 records of 76 ha. An additional 4 ha of light defoliation was identified near Kinglake Community along with an incidental collection of cherry scallopshell moth causing trace level defoliation on suppressed, understory black cherry saplings, south of Whitney, Bancroft District.

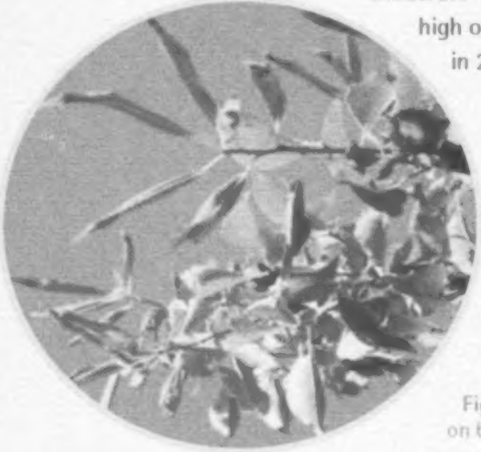


Figure 6.13 Cherry scallopshell moth within tied feeding chambers on black cherry (photo by R. Lidster).

Fall webworm, *Hyphantria cunea* (Drury)

Fall webworm populations have fluctuated considerably in Southern Region over the last few years with a general decline in observations occurring in both 2010 and 2011.

In 2011, moderate levels of defoliation were observed in Kemptville, Algonquin Park and Midhurst districts with light levels reported in Aylmer, Pembroke and Guelph districts. Host trees affected throughout the region include cherry, alder birch, ash, maple, oak, hickory, basswood, and black walnut (Figure 6.14).

In Kemptville District white ash received moderate levels of defoliation along the Ottawa River Parkway with similar defoliation on white birch and pin cherry throughout Prescott and Russell County.

Satellite pockets of moderate defoliation (20%) to ash were also observed along Barron Canyon Road in Algonquin Park, Algonquin District.

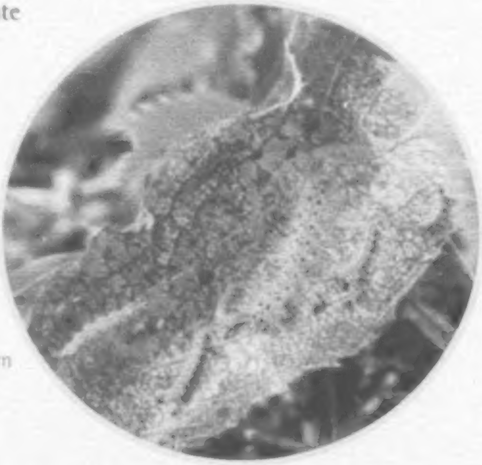


Figure 6.14 Fall webworm larvae exposed from its protective silk webbing (photo by P. Hodge).

In Midhurst District, light-to-moderate defoliation on low-lying white ash was commonly encountered with larger populations detected on ash and sugar maple in Chatsworth and Meaford, Grey County. Populations causing light defoliation were also noted on young roadside ash trees approximately 6 m in height along Hwy. 6 from Wiarton to Tobermory, North Bruce Peninsula, Saugeen Shores and Arran-Elderslie, Bruce County.

Light levels of defoliation also occurred north of Hwy. 17 on choke cherry near Cobden in Pembroke District.

Willow flea weevil, *Isochnus rufipes* (LeC.)

Defoliation caused by willow flea weevil has declined from severe levels in Southern Region in 2009 to light levels in Midhurst and Kemptville districts in 2011. A declining population causing branch mortality on large ornamental willows (*Salix* spp.) persisted in the Clarksburg to Owen Sound area, Grey County, Midhurst District. In Pembroke District, a small recurring population caused moderate-to-severe defoliation to shining leaf willow along Hwy. 17 near Cobden, Renfrew County

Eastern tent caterpillar, *Malacosoma americanum* (F.)

Eastern tent caterpillar is common across Southern Region (Figure 6.15). In 2011 this pest was observed causing moderate-to-severe (20-100%) defoliation to individual cherry trees and shrubs. The characteristic silken tents made in branch crotches were observed across Parry Sound, Midhurst and Peterborough districts on choke cherry and pin cherry. Although no counts were made, it appears the number of infested trees in Chatsworth and Georgian Bluffs, Midhurst District have increased from what was observed in 2010.

Figure 6.15 Eastern tent caterpillar exposed from webbed tent on black cherry (photo by P. Hodge).

Hemlock borer, *Melanophila fulvoguttata* (Harris)

Hemlock borer is a native pest that can be found throughout the range in Ontario of its preferred host, eastern hemlock (Figure 6.16).

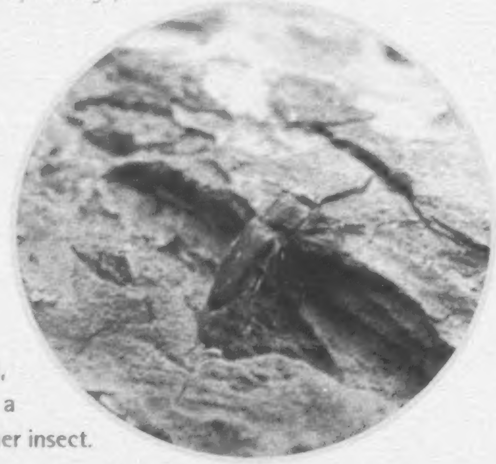
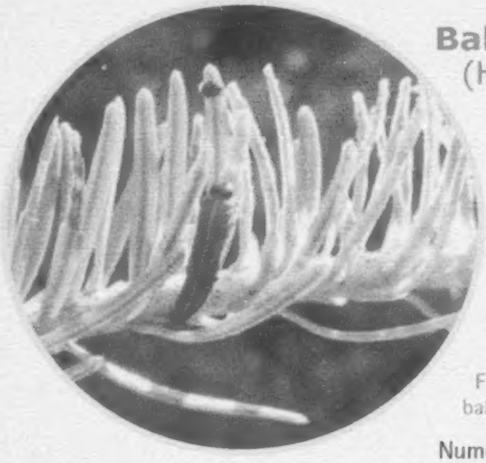


Figure 6.16 Adult hemlock borer recently emerged from eastern hemlock (photo by P. Hodge).

Normally considered a secondary pest and seldom abundant, hemlock borer can develop to outbreak conditions following a primary stress event such as drought or defoliation by another insect.

A population of hemlock borer was identified affecting several mature eastern hemlock on Bay Breeze Lane, Red Stone Lake, Bancroft District. A total of 16 trees were detected with hemlock borer infestations causing severe branch and limb dieback resulting in mortality to 2 mature eastern hemlock. All infested trees identified were predisposed to this secondary pest due to root damage from previous years building construction. Eastern hemlock trees in adjacent forested lands were unaffected by this insect.



Balsam fir sawfly, *Neodiprion abietis* (Harr.)

As the name implies the preferred host of balsam fir sawfly is balsam fir, however it can also feed on white spruce and black spruce in Ontario. Larvae feed on the outside edges of second and third year needles, leaving the centre portion of the needle to shrivel and dry (Figure 6.17). This defoliation typically occurs in the upper crown of balsam fir. The needles often turn brick red before falling off the tree.

Figure 6.17 Balsam fir sawfly larvae feeding on epidermal layer of balsam fir foliage in Bancroft District (photo by P. Hodge).

Numerous recordings of moderate defoliation to the upper crown of balsam fir were made across Peterborough District in 2011. Defoliation ranged from 20-65% and was recorded on Hwy. 7, west of Fowlers Corners, along River Road and Hwy. 7 southeast of Lindsay and at Orange Corners, City of Kawartha Lakes, Peterborough District. Other locations with similar defoliation were located at County Road 607, Noogies Creek and County Road 607, Quarry Road, Smith-Ennismore-Lakefield Township, Peterborough District.

Oak defoliator complex:
Flat leaftier, *Psilocorsis reflexella* (Clem.)
Oak trumpet skeletonizer, *Epinotia timidella* (Clem.)
Hickory leafroller, *Pseudexentera cressoniana* (Clem.)
Oak skeletonizer, *Bucculatrix ainsliella* Murt.

The flat leaftier feeds singly between two tied leaves from late June to late September. Oak trumpet skeletonizer crumples the leaf and creates a black tube from which it feeds until mid-September. Hickory leafroller is often associated with significant oak defoliation events. Oak skeletonizer is a perennial pest of oak throughout Southern Region (Figure 6.18).

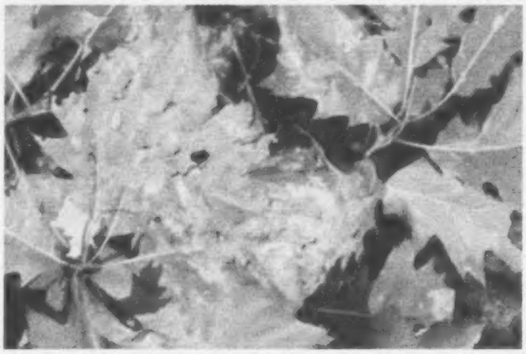


Figure 6.18 Moderate levels of defoliation to red oak in Midhurst District caused by a complex of defoliators (photo by S. McGowan).

These oak defoliators were detected either singly or in combination causing light defoliation throughout the range of oak in

Simcoe and Dufferin counties, Midhurst District in 2011. Leaves were scorched, matted and rolled together by this combination of insects. This damage was not significant enough to be mapped from the air.

Yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.)

Yellowheaded spruce sawfly feeds on spruce within Ontario and is often observed on young, open grown trees (Figure 6.19). Repeated defoliation on an annual basis can cause branch and whole-tree mortality.

In Southern Region several colonies of yellowheaded spruce sawfly were identified in Midhurst District causing severe defoliation on white spruce. Several years of Infestations have occurred east of Stayner in a windrow affecting 75% of white spruce in 2011, contributing to twig and branch dieback. Other infestations were detected along Simcoe County Road 6 north of Elmvale causing light levels of defoliation and along Hwy. 6 north of Dorcas Bay Road, Bruce County, where several roadside trees were 30% defoliated.

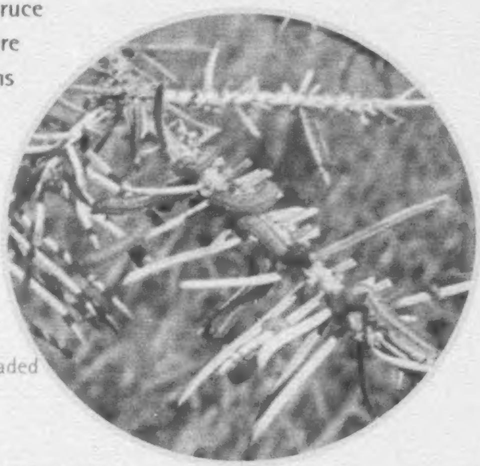


Figure 6.19 Defoliation to spruce caused by yellowheaded spruce sawfly (photo by S. McGowan).

Maple webworm, *Pococera asperatella* (Clem.)

In 2011, moderate levels of defoliation were observed in Aylmer, Aurora and Midhurst districts. High populations were observed in Oxford County near Sweaburg, Aylmer District causing 30-40% defoliation to approximately 75% of a mature sugar maple stand. Defoliation located in Aurora District was recorded at 20% on roadside sugar maples near Scotch Block, Halton Regional Municipality.

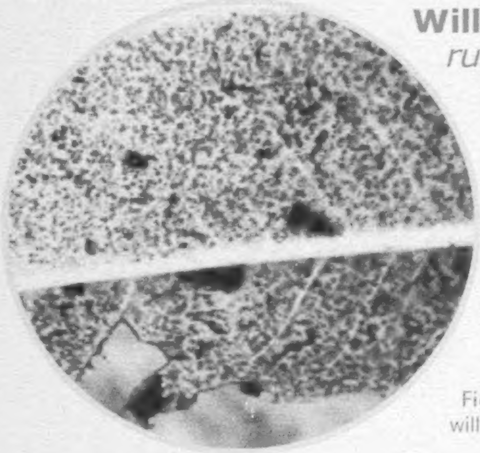
In Midhurst District defoliation was detected in a few scattered locations throughout central Grey County in the Chatsworth area, in association with maple trumpet skeletonizer (*Epinotia aceriella* (Clem.)). A significant population was observed in Oxford County near Sweaburg, Aylmer District where 30-40% defoliation was noted.

Hickory leafroller, *Pseudexentera cressoniana* (Clem.)

Hickory leafroller has been identified feeding on oak species in conjunction with other forest pests for the past several consecutive years in the Southern Region of Ontario.

In 2011, moderate-to-severe defoliation on red oak along Station Hill Road, Renfrew County, Pembroke District was identified as being caused by a complex of defoliators, with hickory leafroller as the primary pest. Other damaging forest pests included gypsy moth (*Lymantria dispar* (L.)) as the main secondary pest along with smaller numbers of speckled green fruitworm (*Orthosia hibisci* (Gn.)) and three-lined leaf roller moth (*Pandemis limitata* (Rob.)).

Hickory leaf roller also caused light defoliation to red oak across the majority of Simcoe and Dufferin counties in combination with flat leaf tier (*Psilocorsis reflexella* Clem.) and oak trumpet skeletonizer (*Epinotia timidella* (Clem.)).



Willow flea weevil, *Rhynchaenus rufipus* (LeC.)

Willow flea weevil is capable of defoliation in the larval and adult stages. Larvae mine within leaves from June to August whereas adults feed on buds and unfolding leaves in the early spring and again in the late summer (Figure 6.20). As its name implies, willow is the preferred host. This pest caused moderate-to-severe defoliation on shining willow along Hwy. 17 east of Cobden, Renfrew County, Pembroke District.

Figure 6.20 Adult willow flea weevil feeding on shining leaved willow (photo by A. Zeppa).

Basswood thrips, *Sericothrips tiliae* Hood

Basswood thrips has been recorded causing moderate-to-severe defoliation in Peterborough District, Southern Region for eight consecutive years. This native pest feeds on basswood foliage throughout its development causing leaf curl and early leaf drop.

In Southern Region, moderate levels of damage to basswood foliage caused by basswood thrips were recorded along Hwy. 7 from the city of Peterborough to Tweed. A crown survey of fifteen trees revealed a 30% reduction in foliage and leaf curl. Light levels of defoliation were also recorded on basswood canopies north of Labarge Road and Lynch Road affecting 5 ha of forested land in combination with maple-basswood leafroller (*Sparganothis pettitana* (Rob.)) and basswood casebearer (*Coleophora tiliaefoliella* Clem.).

Redhumped oakworm, *Symmerista canicosta* Franc

This late-season defoliator caused moderate-to-severe defoliation in Midhurst District, Southern Region in 2011 (Figure 6.21). A 20 ha mixed-wood

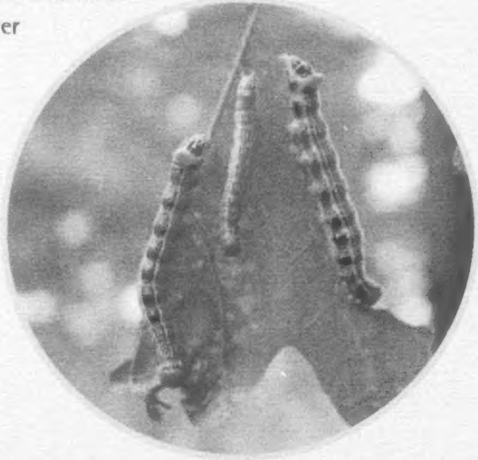


Figure 6.21 Late instar red humped oakworm larvae feeding on white oak (photo by P. Hodge).

stand located just outside Penetanguishine experienced up to 50% defoliation to red oak. Other detections were made adjacent to Awenda Provincal Park, Simcoe County where defoliation remained light, and within Dufferin County Main Forest Tract where trace levels of defoliation were recorded.

Bagworm, *Thyridopteryx ephemeraeformis* (Haworth)

Bagworms are insects characterized by conspicuous protective cases that young larvae create from silk, leaves and twigs (Figure 6.22). Host species include over 100 deciduous and coniferous tree, shrub and woody ornamental species in North America. Cedar and junipers are particularly favoured hosts.

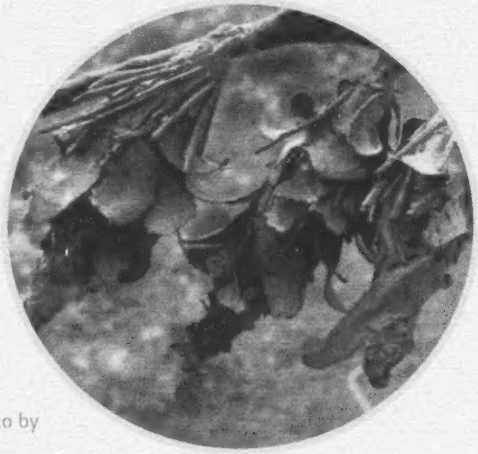


Figure 6.22 Bagworm pupae in protective 'bag' made from host foliage on honey locust in Windsor, Aylmer District (photo by R. Lidster).

A population of bagworm was first detected in Windsor, Aylmer District in 2008. Surveys conducted in 2011 suggest that the initial infestation has grown and spread to other locations throughout the city. Defoliation on young cedars in Coventry Park were reported at moderate-to-severe levels (60-100%) along with an infestation on mature honey locust causing similar levels of defoliation (80-100%). In addition to this, a smaller population was noted on several mature Colorado blue spruce along the city streets which had defoliation at trace levels.

FOREST DISEASES

Ash anthracnose, *Discula fraxinea* (Peck) Redlin & Stack
Maple anthracnose, *Discula umbrinella* (Berk. & Broome) M. Morelet
Basswood anthracnose, *Gloeosporium tiliae* Oudem.

Anthracnose was found on numerous hardwood species throughout Ontario and was commonly encountered in Kemptville, Peterborough and Bancroft districts, Southern Region in 2011. High levels of precipitation in early spring combined with moderate temperatures allowed for enhanced development of anthracnose infection and spore dispersal. Collections made from three different tree species contained anthracnose conidial spores. The three tree species were basswood, ash and silver maple which looked generally unhealthy, with brown lesions and thin, irregular foliage.

Ash anthracnose was identified at light levels on white ash and green ash throughout southern Bancroft District and northern Peterborough District along with pockets located within Smiths Falls and Oxford Mills areas, Leeds and Grenville County, Kemptville District.

Maple and basswood anthracnose were also identified in Kemptville District with maple anthracnose detected at moderate levels (30%) in Oxford Mills, Leeds and Grenville County on silver maple and basswood. Anthracnose was detected on basswood in Jessup's Falls, Prescott and Russell County causing moderate defoliation (40%) to infected basswood foliage.

Cytospora canker, *Cytospora chrysosperma* (Pers.) Fr.

Cytospora canker is often a secondary pest, affecting host trees that have been predisposed by a primary stress agent. Cankers begin as sunken areas of bark and become necrotic, usually around a wound or dead twig. Fruiting bodies of this disease appear on dead bark as tiny, grey bumps, which have characteristic orange spore tendrils that exude from them during moist weather.

This disease was found in conjunction with septoria leaf spot of aspen (*Septoria musiva* Peck) causing cankers and premature yellowing of foliage to eastern cottonwood. Collections were made in two eastern cottonwood plantations located on 8th Line Road and Letrium Road near the village of Metcalfe, Kemptville District. Both plantations were in poor condition with the majority of trees (70%) exhibiting severe dieback and mortality.

Diplodia tip blight, *Sphaeropsis sapinea* (Fr.) Dyko & B. Sutton

Diplodia tip blight is a fungus that kills current-year shoots and major branches, and ultimately causes whole-tree mortality (Figure 6.23). Infection by diplodia tip blight was detected on Austrian pine, red pine and Scots pine in Ontario in 2011.

In Southern Region, moderate levels of infection of diplodia tip blight were observed on Scots pine near Bala, Parry Sound District, and near Kemptville and Smith's Falls, Kemptville District.

Hornbeam anthracnose, *Monostichella robergei* (Desm.) Höhn.

Pockets of this anthracnose fungus were identified in Peterborough, Bancroft and Aylmer districts in 2011 affecting ironwood in Southern Region.

Moderate levels of infection were reported on ironwood saplings in the understory of a young basswood stand at Labarge Road and Lynch Road outside of the Village of Tweed, Peterborough District (Figure 6.24). Similar damage was also reported south of County Road 36, North Kawartha Township, Bancroft District in a maple-oak forest stand affecting approximately 5 ha of the semi-mature ironwood within the stand.

In Aylmer District this anthracnose disease occurred along West Quarter Line, north of the 6th Concession, as well as on Mabee's Sideroad, Norfolk County affecting understory ironwood at moderate levels.

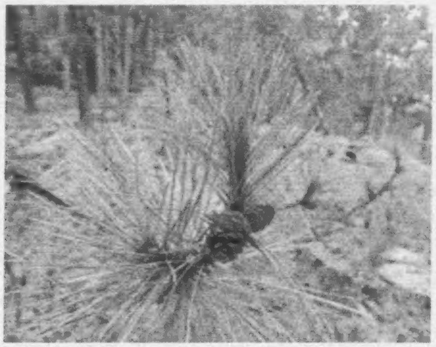


Figure 6.23 Red pine shoot and cones infected with diplodia tip blight in Parry Sound District (photo by W. Byman).

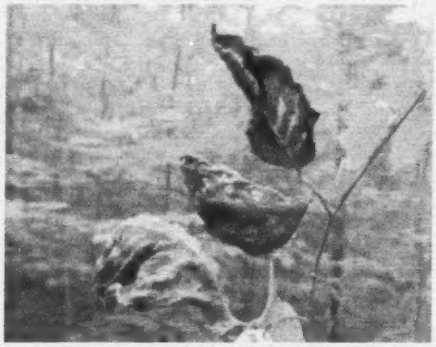


Figure 6.24 Foliage of ironwood affected by hornbeam anthracnose (photo by P. Hodge).

Septoria leaf spot of poplar, *Septoria musiva* Peck

Septoria leaf spot of poplar was found on balsam poplar along County Road 36, Lanark County, Kemptville District causing chlorotic foliage with brown lesions. This leaf disease was also found in an eastern cottonwood plantation within Ottawa, Kemptville District where severely weakened trees had septoria leaf spot on the foliage as well as cankers on fine twigs. In Midhurst and Aurora districts this disease was ubiquitous across the landscape on balsam poplar.

Septoria leaf spot of birch, *Septoria betulae* Pass.
Septoria leaf spot of maple, *S. aceris* (Lib.) Berk. & Broome

These septoria fungi affect numerous hardwood species within Ontario. Both were identified in Midhurst, Aurora and Algonquin Park districts, Southern Region in 2011.

Septoria leaf spot of birch was identified causing moderate levels of damage in Midhurst, Aurora and Algonquin Park districts in mid-to-late August (Figure 6.25). In both Midhurst and Aurora districts septoria leaf spot of birch was ubiquitous across the landscape on white birch. In Algonquin Park this disease was located along Bisset Creek Road and Baron Canyon Road, Algonquin Park District with moderate levels of damage recorded.

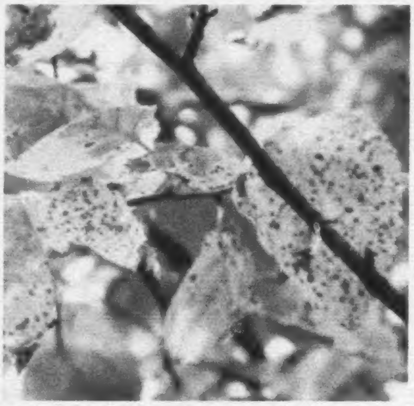


Figure 6.25 White birch foliage severely affected by Septoria leaf spot of birch (photo by A. Zeppa).

Septoria leaf spot of maple was identified at moderate levels on foliage of sugar maple, with curled brown tips and chlorotic spots on 70% of the affected foliage along Kingston Line, Lanark County, Kemptville District.

FOREST ABIOTIC EVENTS

Drought

Drought can have significant impacts on trees in a short period of time. Trees may respond to drought by premature leaf drop and in long lasting or severe drought periods branch and crown dieback may occur.

Hot and dry conditions in the summer of 2011 affected shallowly rooted trees in Kemptville District. Minor damage was noted on several tree species including, but not limited to, ash, elm, maple, oak and black locust across Kemptville District. It also caused moderate-to-severe damage specifically to white ash causing marginal browning to 75% of the foliage on trees along County Road 36 in Snow Station, Lanark County, Kemptville District.

Scorch

Scorch occurs when foliage loses moisture faster than it is replenished and symptoms include the death and browning of leaf margins and tissues. In 2011 high summer temperatures paired with drying winds caused leaf scorch on a variety of hardwoods in the region.

In northwest Aylmer District, scorch occurred on roadside red oak and red ash on well drained, gravel sites in north Lambton County causing 40% browning to affected trees. In central Aylmer District, young silver maple nursery stock was observed with scorch damage at 60% on affected trees. Symptoms were also noted on roadside sugar maple with 30% browning on damaged trees in northern Huron County, Guelph District.

White pine browning

A recent widespread browning of eastern white pine in Ontario, Quebec and New Brunswick has brought upon a specific survey in attempts to identify the causal agent of white pine browning in Ontario (see Northeast Region, white pine browning). Dook's needle blight (*Lophophacidium dooksii* Corlett & Shoemaker) has been identified at several locations but not all. White pine browning has renewed further investigation into this disease. In Southern Region, two satellite pockets of Dook's needle blight were identified causing moderate-to-severe damage to eastern white pine located in Peterborough and Bancroft districts.

As part of the special survey positive identification of Dook's needle blight was recorded on a single tree at moderate levels in a mature eastern white pine plantation at the intersection of Hwy. 35 and Pontypool Road, Cavan-Monaghan Township, Peterborough District.

Individual trees in a natural forested area north of Bobcaygeon, Galaway-Cavendish & Harvey Township, Bancroft District were also affected at severe levels in April, 2011.

Index

FOREST PEST SCIENTIFIC NAME INDEX

Acalitus fagerinea (Keifer) 81
Acantholyda erythrocephala (L.) 33
Acordulecera dorsalis Say 82
Acordulecera sawfly 82
Agrilus anxius Gory 55, 82
Agrilus anxius, Gory 56
Agrilus planipennis Fairmaire 35
Alsophila pometaria (Harr.) 56, 82
Altica ambiens LeC 71
Anacampsis niveopulvella (Chamb.) 45
Anisota virginiensis (Drury) 71
Arachnidomyia (=Sacophaga) aldrichi (Parker) 24
Arge pectoralis (Leach) 83
Argyresthia aureoargentella 72, 84
Argyresthia aureoargentella (Pack.) 72
Argyresthia canadensis Free 84
Argyresthia thuiella Brower 72
Armillaria spp. 63

Baliosus nervosus (Panz.) 84
Bucculatrix ainsliella Murt. 90
Bucculatrix canadensisella (Cham.) 56

Choristoneura conflictana (Wlk.) 72, 75
Choristoneura fumiferana (Clem.) 11
Choristoneura pinus pinus Free. 15
Choristoneura rosaceana (Harr.) 86
Ciborinia whetzelii (Seaver) 63
Coleophora comptoniella (McD.) 41
Coleophora laricella (Hbn.) 39
Coleophora limosipennella (Dup.) 86
Coleophora pruniella Clem. 87
Coleophora serratella (L.) 41
Coleophora serratella L. 87
Coleophora tiliaefoliella Clem 92
Coleotechnites thujaella (Kft.) 84
Croesia semipurpurana (Kft.) 86
Cronartium comptoniae Arthur 20
Cronartium ribicola J.C. Fisch. 50
Cryptococcus fagisuga Linding 41

Datana integerrima G. & R. 87
Diprion similis (Htg.) 42
Discula destructiva Redlin 51
Discula fraxinea (Peck) Redlin & Stack 93
Discula umbrinella (Berk. & Broome) M. Morelet 93
Dryocampa rubicunda (F.) 74

Enargia decolor (Wlk.) 75
Endocronartium harknessii (J.P. Moore) Y. Hirats. 20
Epinotia nisella (Cl.). 62
Entoleuca mammata J. D. Rogers & Y. M. Ju 62
Entomophaga maimaiga (Humber, Shimazu & R.S. Soper) 44
Epinotia aceriella (Clem.) 91
Epinotia criddleana Kft. 62
Epinotia solandriana (L.) 58
Epinotia solandriana L. 45
Epinotia timidella (Clem.) 75, 90, 92

Fusicoccum abietinum (Hartig) Prill. & Delacr 64

Gloeosporium tiliae Oudem 93

Hemichroa crocea (Geoff.) 58
Hydria prunivorata (Fgn.) 88
Hylurgopinus rufipes (Eichhoff) 53
Hyphantria cunea (Drury) 58, 76, 88

Isochnus rufipes (LeC.) 89

Leucoma salicis (L.) 43
Lophophacidium dooksii Corlett & Shoemaker 79
Lymantria dispar (L.) 43, 92

Malacosoma americanum (F.) 76, 89
Malacosoma disstria Hbn 21
Melanophila fulvoguttata (Harris) 89
Monostichella robergei (Desm.) Höhn. 94
Mycosphaerella dearnessii M.E. Barr 25, 45

Neodiprion abietis (Harr.) 90
Neodiprion sertifer (Geoff.) 45

Neonectria faginata (M.L. Lohman, A.M.J. Watson & Ayers) Castl. & Rossman 41, 51
Nymphalis antiopa (L.) 59, 77

Oligonychus ununguis (Jac.) 72
Ophiostoma novo-ulmi Brasier 53
Orthosia hibisci (Gn.) 45, 92

Pandemis limitata (Rob.) 45, 92
Parthenolecanium corni (Bouche) 46
Pentamerismus spp. 72
Peridermium harknessii J.P. Moore 64
Petrova albicapitana (Bsk.) 60
Phyllonorycter apparella (Free.) 59
Phyllonorycter nipigon (Free.) 60, 77
Phyllonorycter ontario (Free.) 77, 78
Pikonema alaskensis (Roh.) 60, 91
Pissodes strobi (Peck) 60
Plagiodera versicolora (Laich.) 46
Pococera asperatella (Clem.) 91
Pseudexentera cressoniana 45, 82, 90, 91
Pseudexentera oregonana (Wlsm.) 61
Psilocorsis reflexella (Clem.) 90

Rhynchaenus rufipus (LeC.) 92

Saperda calcarata Say 62
Scolytus multistriatus (Marsham) 53
Septoria betulae Pass. 95
Septoria musiva Peck 56, 94
Sericothrips tiliae Hood 92
Sparganothis pettitana (Rob.) 92
Sphaeropsis sapinea (Fr.) Dyko & B. Sutton 94
Symmerista canicosta Franc 71, 78, 92
Symmerista canicosta Franc. 71, 78
Symmerista leucitys Franc. 78, 79

Thyridopteryx ephemeraeformis (Haworth) 93
Tomicus piniperda (L.) 48
Toumeyelaa parvicornis (Ckll.) 45

FOREST PEST COMMON NAME INDEX

Alder flea beetle 71
Armillaria root rot 20, 63
Ash anthracnose 93
Aspen criddleana 62
Aspen leafblotch miner 59, 77, 78
Aspen twoleaf tier 75

Balsam fir sawfly 90
Balsam poplar leafblotch miner 60, 77
Basswood anthracnose 93
Basswood casebearer 92
Basswood leafminer 84
Basswood thrips 92
Beech bark disease 41, 51, 52, 53
Beech scale 41, 42, 51, 52
Birch-aspen leafroller 45, 58
Birch casebearer 41, 87
Birch sawfly 83
Birch skeletonizer 56
Bronze birch borer 55, 56, 82
Brown cedar leafminer 84
Brown spot needle blight 25, 26, 27, 45

Cedar leafminer 72, 84, 85
Cherry casebearer 87
Cherry scallopshell moth 88

Diplodia tip blight 94
Dogwood anthracnose 51
Dook's needle blight 79, 80
Dutch elm disease 53, 54

Early aspen leafcurler 61
Eastern tent caterpillar 76
Elm casebearer 86
Emerald ash borer 35
Erineum mite 81
European elm bark beetle 53
European fruit lecanium 46
European pine sawfly 45, 46

Fall cankerworm 56, 82
Fall webworm 58, 76, 77, 88
False spider mite 72
Flat leaftier 90

Forest tent caterpillar 21, 22, 24
Fusicoccum canker of balsam fir 64

Greenstriped mapleworm 74, 75
Gypsy moth 43, 44, 45, 92

Hemlock borer 89
Hickory leaf roller 45
Hickory leafroller 90, 91
Hornbeam anthracnose 94
Hypoxylon canker 62

Imported willow leaf beetle 46
Ink spot of aspen 63
Introduced pine sawfly 42

Jack pine budworm 15, 19, 21, 49

Larch casebearer 39
Large aspen tortrix 72, 73, 74, 75
Large flesh fly 24
Lesser birch casebearer 41

Maple anthracnose 93
Maple-basswood leafroller 92
Maple trumpet skeletonizer 91
Maple webworm 91
Mourning cloak butterfly 59

Native elm bark beetle 53
Northern pitch twig moth 60

Oak leafshredder 86
Oak skeletonizer 90
Oak trumpet skeletonizer 75, 76, 90, 92
Obliquebanded leafroller 86
Orangehumped mapleworm 78, 79

Paleheaded aspen leafroller 45
Pine false webworm 33, 34, 45
Pine shoot beetle 48, 49
Pinkstriped oakworm 71
Poplar borer 62

Redhumped oakworm 71, 78, 79, 92

Satin moth 43
Semi-mature tissue needle blight 79
Septoria leaf spot 56, 95
Septoria leaf spot of aspen 94
Septoria leaf spot of birch 95
Septoria leaf spot of maple 95
Septoria leaf spot of poplar 95
Speckled green fruitworm 45, 92
Spiny elm caterpillar 59, 77
Spruce budworm 11, 14
Striped alder sawfly 58
Sweet fern blister rust 20, 21

Three-lined leaf roller 45, 92
Tortoise scale 45
Toumeyelaa parvicornis (Ckll.) 45

Walnut caterpillar 87
Western gall rust 20, 21, 64
White pine blister rust 50
White pine browning 79, 80, 96
White pine weevil 60
Willow flea weevil 89, 92

Yellowheaded aspen leaftier 62
Yellowheaded spruce sawfly 60, 91

ABIOTIC EVENT INDEX

Aspen decline 64, 66
Blowdown 20, 21, 27, 28, 29, 30, 31, 32
Drought 21, 48, 67, 68, 69, 72, 84, 89, 96
Drought/Scorch 67
Ozone damage 79
Scorch 96
Snow damage 21, 69
White pine browning 79, 80, 96

HOST SPECIES NAME INDEX

Alder (*Alnus spp.*) 58, 67, 71, 88
American beech (*Fagus grandifolia* Ehrh.) 22, 32, 41, 42, 51, 52, 79, 81, 83
Ash (*Fraxinus* spp.) 32, 35, 36, 37, 38, 39, 46, 56, 77, 88, 89, 93, 96
  Green ash (*F. pennsylvanica* var. *subintegerrima* (Vahl) Fern.) 93

  - Red ash (*F. pennsulanica* Marsh.) 96
  - White ash (*F. americana* L.) 22, 88, 89, 93, 96
- Balsam fir (*Abies balsamea* (L.) Mill.) 11, 12, 14, 15, 29, 64, 90
- Basswood (*Tilia americana* L.) 8, 3, 22, 32, 47, 56, 84, 88, 92, 93, 94
- **Birch** (*Betulae* spp.) 41, 45, 55, 56, 58, 67, 71, 82, 83, 87, 88, 95
  - White birch (*B. papyrifera* Marsh.) 21, 22, 41, 47, 55, 56, 58, 77, 82, 83, 87, 88, 95
- Black walnut (*Juglans nigra* L.) 87, 88
- Butternut (*Juglans cinerea* L.) 87
- **Cherry** (*Prunus* spp.) 77, 87, 88, 89
  - Pin cherry (*Prunus pensylvanica* L. f.) 58, 88, 89
  - Black cherry (*P. serotina* Ehrh.) 88
  - Plum (*Prunus* spp.) 46
- Eastern flowering dogwood (*Cornus florida* L.) 51
- Eastern Hemlock (*Tsuga canadensis* (L.) Carriere) 89, 90
- Eastern white cedar (*Thuja occidentalis* L.) 31, 32, 72, 84, 86
- **Elm** (*Ulmus* spp.) 53, 54, 59, 77, 86, 87, 96
  - White elm (*U. americana* L.) 22, 83, 86, 87
- European larch (*Larix decidual* Mill.) 39
- Hawthorn (*Crataegus* spp.) 47
- Hickory (*Carya* spp.) 45, 87, 88, 92
- Honey locust (*Gleditsia triacanthos* L.) 93
- Ironwood (*Ostrya virginiana* (Mill.) K. Koch) 94, 95
- Junipers (*Juniperus* spp.) 93
- **Maple** (*Acer* spp.) 2, 9, 46, 56, 74, 75, 83, 88, 91, 93, 94, 96
  - Manitoba maple (*A. negundo* L) 56
  - Red maple (*A. rubrum* L.) 21, 74, 75, 82
  - Silver maple (*A. saccharinum* L.) 56, 94
  - Sugar maple (*A. saccharum* Marsh) 21, 22, 24, 32, 74, 79, 81, 83, 89, 91, 95, 96
- **Oak** (*Quercus* spp.) 21, 43, 45, 46, 47, 71, 76, 78, 79, 81, 82, 86, 88, 90, 91, 92, 93, 94, 96
  - Bur oak (*Q. macrocarpa* Michx.) 44, 86
  - Red oak (*Q. rubra* L.) 45, 71, 76, 79, 82, 86
  - White oak (*Q. alba* L.) 46, 86
- **Pine** (*Pinus* spp.) 18, 19, 20, 21, 33, 34, 35, 42, 45, 46, 48, 49, 50, 60, 61, 64, 79, 80, 94, 95, 96
  - Jack pine (*P. banksiana* Lamb.) 15 16, 17, 18, 19, 20, 21, 28, 43, 45, 49, 50, 60, 61, 63, 64, 68,69, 75
  - Eastern white pine (*P. strobus* L.) 16, 17, 25, 27, 29, 33, 34, 35, 42, 43, 50
  - Himilayan blue pine (*P. griffithii* McClell.) 34
  - Japanese white pine (*P. parviflora* Siebold & Zucc.) 34
  - Korean white pine (*P. koriensis* Siebold & Zucc.) 34
  - Macedonian pine (*P. peuce* Griseb.) 34
  - Mugho pine (*P. mugo* Turra) 45
  - Red pine (*P. resinosa* Ait.) 16, 30, 33, 43, 45, 46, 50, 94
  - Scots pine (*P. sylvestris* L.) 25, 26, 27, 34, 42, 43, 45, 46, 50, 94
- **Poplar** (*Populus* spp.) 22, 43, 60, 77, 95
  - Balsam poplar (*P. balsamifera* L.) 58, 60, 62, 64, 65, 77, 95
  - Eastern cottonwood (*P. detoides* Bartr. ex Marxh. subsp. *deltoides*) 94, 95
  - European white poplar (*P. alba* L.) 43
  - Large tooth aspen (*P. grandidentata* Michx.) 21, 59, 78
  - Trembling aspen (*P. tremuloides* Michx.) 21, 25, 28, 29, 31, 43, 45, 58, 59, 61, 62, 63, 64, 65, 72, 74, 75, 78
- **Spruce** (*Picea* spp.) 11, 12, 13, 14, 15, 29, 60, 69, 72, 91
  - Black spruce (*P. mariana* (Mill.) BSP) 11, 28, 29, 31, 60, 64, 90
  - White spruce (*P. glauca* (Moench) Voss) 11, 12, 13, 14, 15, 90, 91
- Tamarack (*Larix laricina* (Du Roi) K. Koch) 39, 40, 41
- **Willow** (*Salix* spp.) 3, 46, 47, 77, 89, 92
  - Shining leaf willow (*S. lucida* Muhl. subsp. *lucida*) 89